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A Study to Determine the Factors Affecting Efficiency in Use of Irrigation Water in Weber County, Utah. 1938

Archie L. Christiansen
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A STUDY TO DETERMINE THE FACTORS AFFECTING EFFICIENCY IN USE OF IRRIGATION WATER IN WEBER COUNTY, UTAH. 1938

by

ARCHIE L. CHRISTIANSEN

A thesis submitted in partial fulfillment of the requirements for the degree of

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INTRODUCTION

Utah has two major natural resources, land and water. Because these do not, when separated, have the same agricultural value as when used jointly, by separation each loses much of its significance.

Natural precipitation varies greatly in different sections of the state, from 5 to 10 inches on the desert area to 40 or more on the high mountain ranges. The moisture which falls on the cultivable land is not sufficient to produce high yields of crops of desirable varieties; but when supplemented by irrigation, bounteous production results.

Since irrigation water is the factor which determines agricultural development, future extension depends on the water available. Without water, the production of agricultural products would be extremely limited and Utah lands would be generally of relatively little value; properly irrigated, the land supports a considerable population.

Weber County lies to the east of Great Salt Lake, its chief farming area extending from the foothills of the Wasatch Mountains to the lake shore. A minor farming area of approximately 6500 acres lies to the east in Ogden Valley, which is connected with the Salt Lake Valley by Ogden Canyon. The county has an area of 346,240 acres of which 55,966 are cultivated land. Approximately 85 per cent of this cultivated area, or 50,661 acres, is irrigated. This land supports 20 towns and a farm population of 9,766 people. Ogden City, located near the geographic center of the county, has a population of 42,674. Twenty per cent of the farms are less than 10 acres in extent, and 67 per cent less than 50 acres. Twenty per cent of the total farms range from 50 to 99 acres in size, and only 13 per cent are larger than 100 acres. As the average

acreage of irrigation land per farm in Weber County is 24.8, more acres of irrigated land is the paramount need of Weber County.

Two sources of new land were pointed to by the County Land Use Committee. First, the drainage of an estimated 10,000 acres of lowlands, which, when surplus water is removed, will make good productive farms. Second, areas of waste land exist on practically every farm. Reorganization of fields, change of ditch and fence locations, and leveling would bring these idle acres into production.

In order to provide irrigation water for this increase in land, the development of every available storage site will be required, as well as the more efficient use of the present irrigation supply. Storage will be at a relatively high cost; whereas the efficient use of the present supply will require a rather small outlay.

Irrigation engineers and soil physicists have worked out soil and water relationships, experiment stations have tested theories of irrigation, and out of all this scientific information have come the facts on which efficient use of water is based. If a farmer knows the texture, depth, and water storage capacity of the soil and the streamflow, his problem then becomes one of physical application. It seems that this soil and water relationship is not clearly understood by the farmers generally, and many have not yet been convinced that the soil is a storage reservoir. The farmer's use of water is too often based on his water-rights in the company or on the amount of water available during the season. Measurement of the flow of irrigation streams on the farms tends to clarify the soil and water relationship in the minds of the irrigators.

Weber County has 44 main canals and many laterals. Heavy seepage losses occur in the canals which cross porous soil and coarse deposits. Data included in this report will show that only about one-third of the

water diverted from streams and reservoirs is actually applied to crop lands. The loss of this water is serious from two standpoints: First, it costs a great deal to store water and to divert and carry it through irrigation systems. The total cost of storage and transportation must be placed on the one-third that finally irrigates crops. Second, water-logging caused by seepage from canals works a serious injury to farm lands. Economy in the use of water must include the distribution system as well as its application on the land.

Soil Classes.

As a basis for this study, the soils of Weber County are divided into 3 general classes.

I. Bench land soils, usually of shallow depth, coarse texture, and having no hardpan near the surface and taking water rapidly.

II. Medium-elevation land soils, chiefly fine sandy loams, sandy loams, and sandy clay loams. They are usually of satisfactory depth, high fertility, and good drainage. Some are underlaid with hardpan at various depth, others with water-bearing quicksand. This class constitutes approximately 70 per cent of the irrigated land of the county.

III. Valley bottom lands, usually silts and silt loams, or clay and clay loams soils with water table close to the surface. Often they have hardpans rich in lime. When drained and properly managed, these soils make fairly productive farms.

Objectives.

In this thesis it is proposed to show:

I. The amounts of water applied to various kinds of crop.

II. Relation between the amount of water applied and crop yields on the different soil classes.

III. Present application of water according to soil classes in comparison with the water-storage capacity of the soil.

IV. Relation of amount of water used to acre-yields by communities.

V. Relation of the quantity of water delivered to selected canals to amount used on sample farms.

Value of Records.

The intelligent application of irrigation water demands that the farmer know the characteristics of his soil. The slope of the land is important in that it determines to a great extent the system of irrigation. The texture and depth of soil are related to the water storage capacity and the rate of water penetration, and the location of the water table has a bearing on water-application efficiency. (1) Discharge records of the irrigation stream are necessary in order that time or rate of application may be adjusted to the soil characteristics. From this information the length of run and the time required for ideal application may be ascertained. A study of the irrigation records suggests changes in management which tend toward efficient use of water. Without records, comparisons cannot be made.

Source of Material Used.

The Agricultural Adjustment Program for 1937 included payments to farmers in Davis and Weber Counties who complied with requirements in irrigation practice. Keeping of detailed irrigation records was required of each cooperator. An irrigation engineer was employed to supervise the practice. Each cooperator was required to install an approved weir and mail a report of water used in each crop for each irrigation. The engineer visited cooperating farmers as often as possible,

checked the weir and compiled the detail records. In 1938 the county agent, assisted by three leading farmers who had cooperated in the 1937 program, supervised the irrigation practice. Records were compiled by clerks in the county agent's office. (2)

In 1937 there were 49 Weber County farmers who complied with all requirements, while during 1938, 337 did all the work required. After all questionable records have been discarded there are 306 remaining irrigation records which form the background of this thesis. Of these detailed records, 191 have been used in the body of this thesis to form the summary tables. A detailed record of all 306 farms, by towns, is included in the appendix.

Scope.

The 1935 census shows that there are 1651 farms having 10 acres or more of land in Weber County. Irrigation records used in this thesis form a cross-section of 15.6 per cent of these 1651 farms and will show the present practices of water application in relation to soil classes and to crop yields; it will also show the approximate water storage capacity of soils and the depth of the root zones of the various crops; the relation of the amount of water used to acre-yields by communities. Finally, it will show the relationship between the quantity of water used on farms and diverted into the canals which service these farms.

Water Storage Capacity of Soils.

Soil may be regarded as a water storage reservoir where moisture for plant life is stored from one irrigation to the next. Storage capacity of soils varies greatly as the soil depth, texture, organic, and humus content varies. Etcheverry and Harding make the following comment on soil storage capacity:

The soil moisture readily available to plants is represented by the difference between the field capacity and the moisture when irrigation is desirable. Plant roots require air as well as water in the soil. Saturated soils lack air; dry soils contain adequate air but lack moisture. There is no single optimum proportion between air and water in soils. Crops grow to equal advantage with the moisture anywhere between the minimum desirable and the field capacity. A soil free to drain will not retain sufficient water to be harmful to the crops. The rate of growth is not reduced owing to shortage of moisture until the supply begins to approach the wilting percentage.

Soil moisture is continually changing. On bare soils adjustments take place following rain or irrigation, moisture moving downward by gravity flow or capillary movement as capillary adjustment takes place and upward by capillary movement as evaporation from the soil surface occurs. On cropped lands similar adjustments take place, complicated in addition by the extraction of moisture by plant roots. Moisture in soils under field conditions is never uniform or stable, although it may approach stability at the lower moisture contents. Consequently observations under field conditions which represent the moisture content at the different moisture points are difficult to obtain.

Generalized relationships of the four principal soil-moisture properties are shown in Fig. 2, in which the average inches depth of water per foot depth of soil for the usual depths of soil moisture use by crops are plotted in relation to the soil texture. The curves in Fig. 2 represent the moisture content that would be expected if the soil moisture to the depth of the principal plant use was uniform. For usual conditions the soil moisture in the surface foot of soil is larger at field capacity and smaller when irrigation is desirable than the average for the depth of soil from which the crops secure their principal supply.

Figure 2 illustrates the proportion of the total soil moisture that may be useful to the plants and the large differences in the amounts of moisture in soils of different textures. The hygroscopic moisture for heavy soils exceeds the field capacity (is available to plants in coarse soils than in) of coarse-textured soils. While a larger percentage of the field capacity is available to plants in coarse soils than in those of heavier texture, the actual amount of readily available moisture is less than that for heavier soils.

For light-textured soils without heavier subsoils, or where ground water does not occur within reach of the crop roots, an average of from 0.75 inch depth of water per foot depth of soil for the usual depths of soil utilizes by the drop can be added and retained from an irrigation. Moisture movement occurs readily in such soils and the amounts of

> moisture shown for the field capacity in Fig. 2 can be obtained to the full depth of penetration desired. As general crops may utilize moisture to the depths of 5 or 6 feet, 3 to 5 inch depth of water may be added and retained in such soils from an irrigation. Sandy soils with heavier subsoils may retain larger amounts of moisture.
>
> For uniform soils of medium texture, from 1 to 1.25 inch depth of water may be added and retained per foot depth of soil where the soil is free from heavy subsoils or the effects of the ground water table. As penetration is also readily secured in such soils, 6 inch total depth of water may be added to the soil moisture and retained within reach of the plant roots. (3)

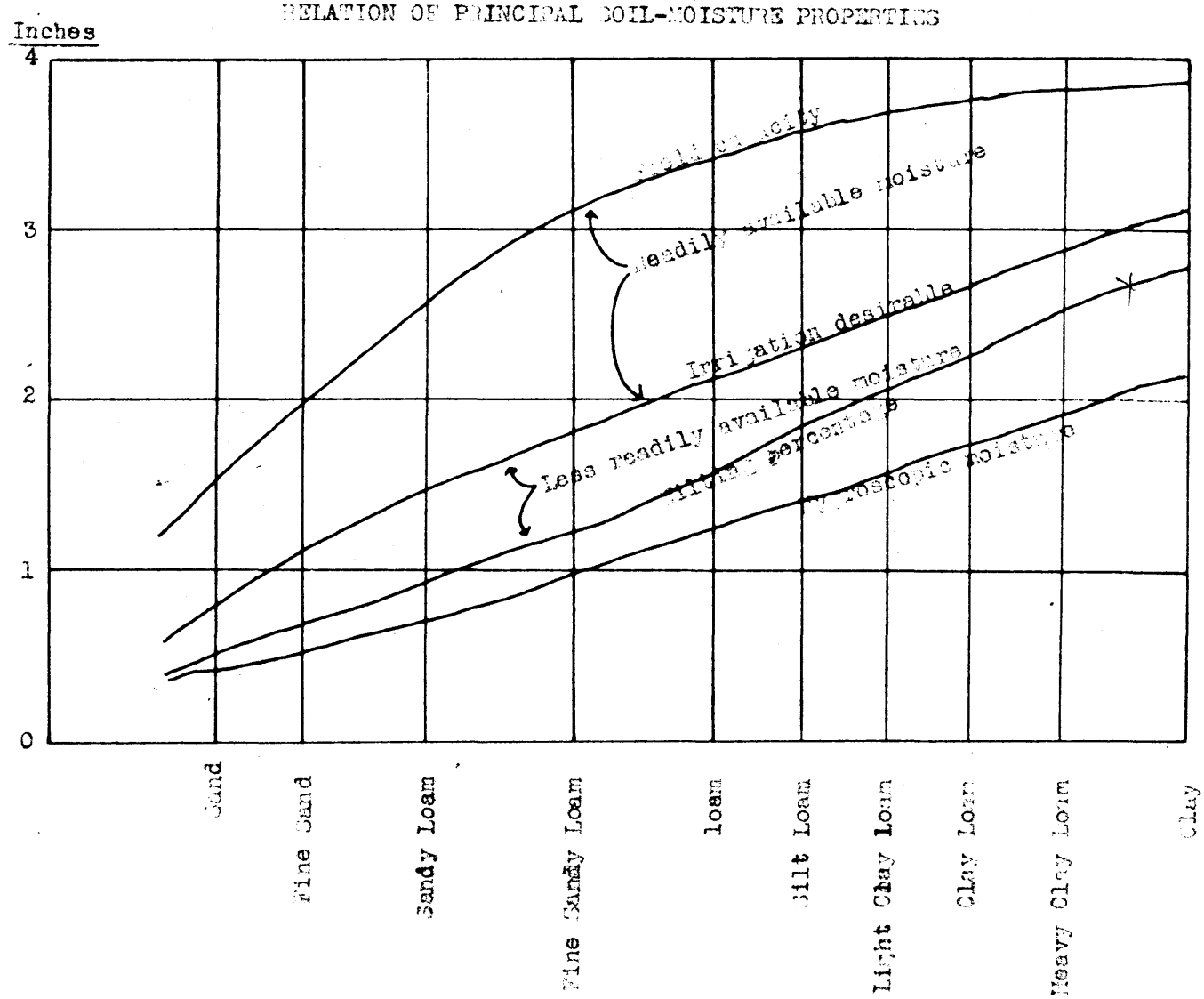
Many investigators have studied the water storage capacity of soils. F. H. King reported his experiments in 1889 and showed that 4.5 inches of water was necessary to bring 4 feet of soil "from the lower limit of the best productive stage of water content to the upper limit" or 1.1 inches of water per foot depth of soil.(4) Israelson and West discuss soil storage capacity in Utah Experiment Station Bulletin 183 as follows:

> The water capacity of Millville loam soil at the Experiment Station Farm was first investigated by Widstoe and McLaughlin in 1902 and 1903.
>
> As a result of nearly 3,000 trials covering five year's work, Widstoe and McLaughlin found the average maximum moisture content to a depth of 8 feet to be 18 per cent, or 2.82 inches per foot depth of soil. Furthermore, when the moisture content decreased to about 11.5 per cent the plants found great difficulty in obtaining a sufficient water supply. It was therefore necessary to add in a single irrigation the difference between 18 and 11.5 per cent, or 6.5 per cent, which is equal to 1.03 inches of water, for each foot of soil that needs moistening. (5)

The capacity of a Nebraska sandy loam of uniform texture was determined at 16 to 18 per cent of its dry weight, but 7 to 8 per cent was available to the plants. This is approximately 1¼ inches of water per foot depth of soil. (6)

Israelson and West summarize Bulletin 183 as follows:

FIGURE 1.
AVERAGE INCHES DEPTH OF WATER PER FOOT DEPTH OF SOIL. GENERALIZED RELATION OF PRINCIPAL SOIL-MOISTURE PROPERTIES



Copied from "Irrigation Practice and Engineering" by Etcheverry and Harding, Vol. I, Figure 2, Page 13.

(3) A review of water-capacity measurements made by 10 investigators in 8 states and on 20 different classes of soil shows that the amount of water absorbed by the soil when in need of irrigation varied from ½ inch of water to 1 foot of soil in a sand, to 2.25 inches of water to 1 foot in a clay loam soil.

(4) A typical deep volcanic loam near Grace, Idaho, one day after flooding held more than 2 inches in the surface foot and nearly ½ inch in the sixth foot in excess of the amount of water held before irrigation. The same soil 6 days after irrigation held only 1½ inches in the first foot and less than one-fifth inch in the sixth foot.

(5) A typical shallow volcanic loam soil near Central, Idaho, held over 2 inches in the surface foot one day after irrigation and more than 1 3/4 inches in the fourth foot in excess of the amount held before flooding. Six days after irrigation the first foot of the shallow soil held 1 2/3 inches and the fourth foot held 1½ inches more than the amount held before irrigation.

(6) A fine sandy loam of the Sevier Valley, Utah, retained nearly 2½ inches in the surface foot 1 day after flooding and about 1 inch in the sixth foot. Twenty days after flooding, the surface foot held 1 inch and the sixth foot held 0.9 an inch more than was held before the irrigation.

(7) As an average of nearly 3000 trails Widstoe and McLaughlin found that the upper 6 feet of the Greenville loam soil retained a little more than 1 inch of water for each foot of soil about 24 hours after irrigation.

(8) Investigations by Harris and Bracken show that plats on the Greenville Farm to which 1 inch of water was applied weekly held about ½ inch of available water per foot of soil immediately before irrigation. The plats which were given 2½ inches weekly held 3/4 of an inch of available water before irrigation, and those which were given 7½ inches weekly held a minimum of 1½ inches of available water per foot of soil. In addition, about 60% of the 7½ inches applied weekly percolated below the depth of 6 feet where it was probably lost to the use of plants.

(12) Ten days after the heavy irrigations were applied by the authors each of the plats held the same amount of available water, namely, about 1½ inches per foot in the upper 6 feet.

(13) The moisture-capacity investigations here reported show that as a general rule soils have the capacity to absorb from ½ to 1½ inches of water to each foot depth of soil that need moistening, the actual capacity for a given soil depending

on its texture and structure. Sandy or gravelly soils retain the smaller amounts and clay loam soils retain the larger amounts.

(14) Information concerning the water capacity of soils made available by the investigations here reported, and by other similar studies, from the basis for intelligent determination of the amounts of water to apply to various soils in single irrigations, but they do not assist the irrigator to obtain uniformity in the lateral distribution of water. This must be accomplished by careful preparation of land and proper adjustment of the size of stream used to the soil irrigated. (7)

Water Requirements of Crops.

A knowledge of the rooting habits of crops is necessary in order to determine the depth of soil which must be irrigated. Proper application of water is based on plant needs and the storage capacity of the soil.

The irrigation quotations on the previous pages and the root zone figures on the following page are the authoritative support for statements on the water storage capacity and depth of root zone used in the following discussion. The author has personally visited each farm whose record is used and approximately 125 soil borings have been made to determine the soil characteristics of the various areas.

Lacking definite proof of the crop root penetration on the soils designated as Class I, it is necessary to assume that the figures used are reasonably correct. They are based on personal experience and information furnished by farmers. The tendency has been toward liberality in setting the water storage capacity of these soils. The following illustrations are taken from Conservation Bulletin No. 2, Farmer's Irrigation Guide, Bureau of Reclamation, page 24 to 29, inclusive.

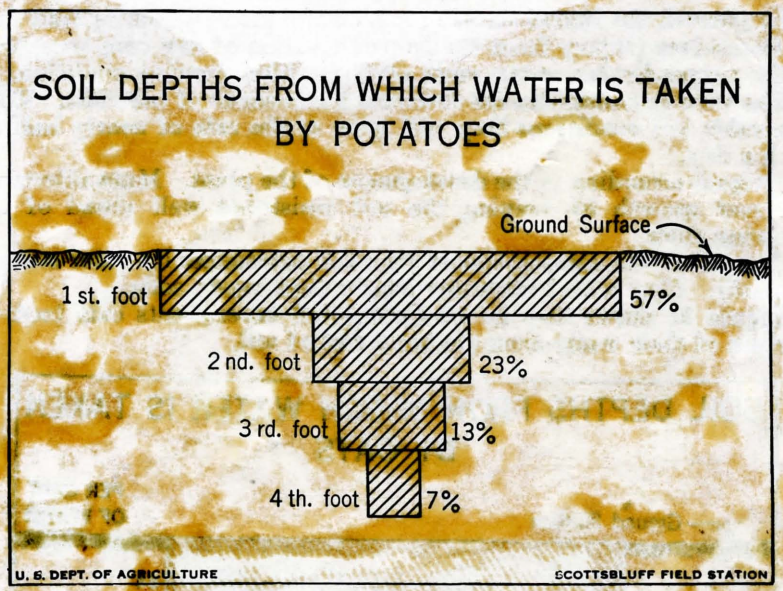


Figure 29.—*Moisture depths—potatoes.*

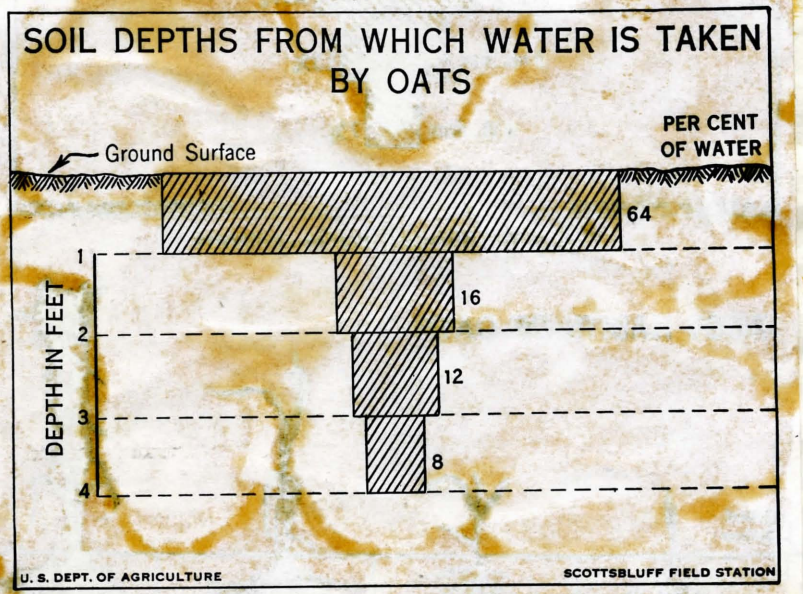


Figure 31.—*Moisture depths—oats.*

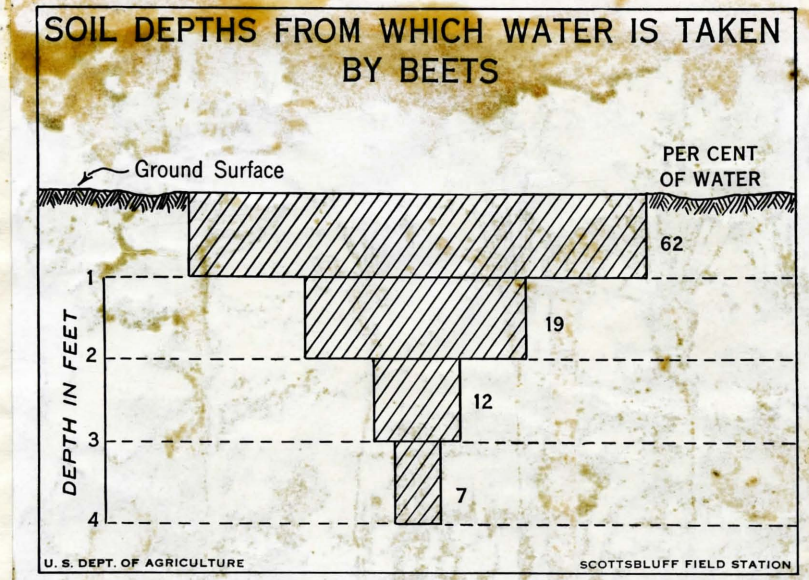


Figure 33.—*Moisture depths—sugar beets.*

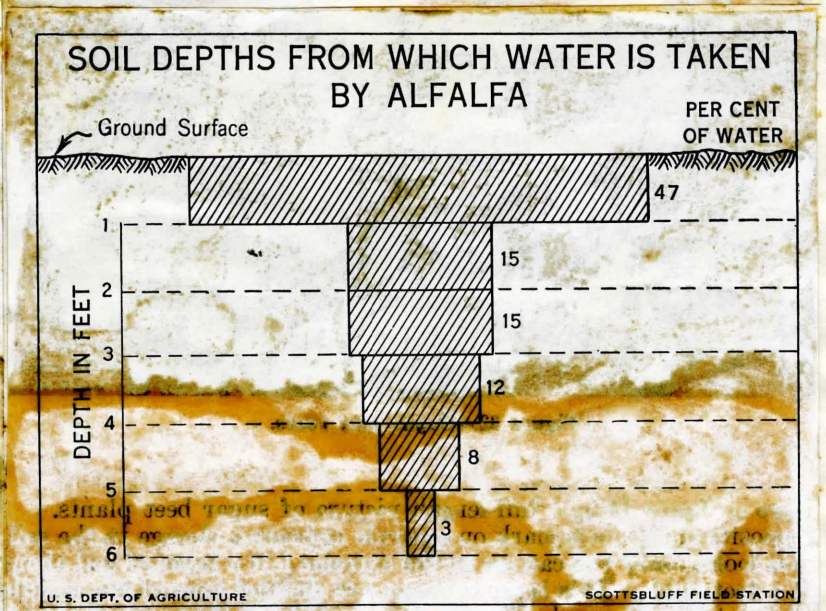
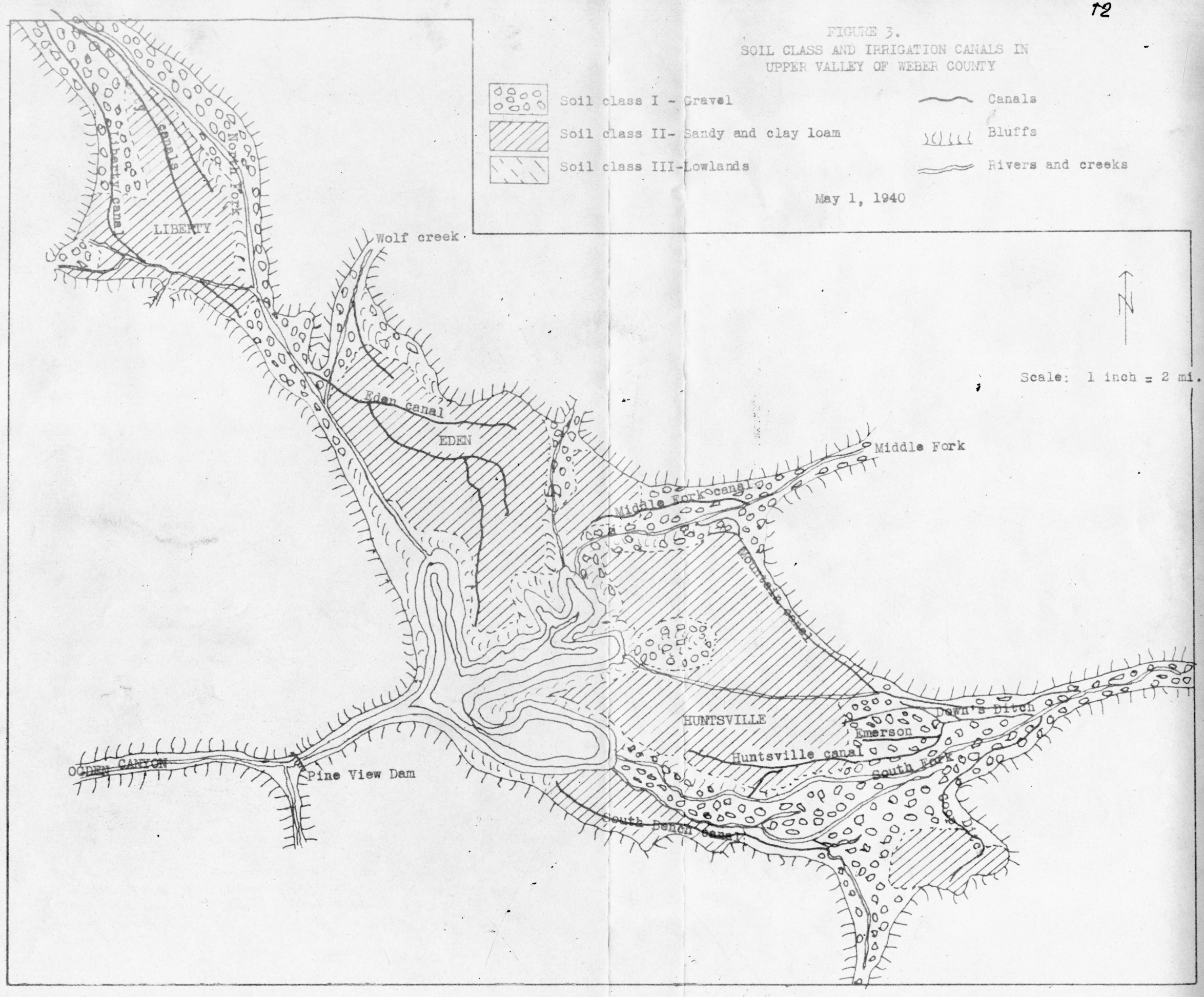


Figure 34.—*Moisture depths—alfalfa.*

FIGURE 3.
SOIL CLASS AND IRRIGATION CANALS IN
UPPER VALLEY OF WEBER COUNTY



OGDEN VALLEY

Ogden Valley, located about 12 miles east of Ogden City on the east side of the most westerly range of the Wasatch Mountains, according to Legette and Taylor "is the fault trough bounded on both the east and the west by faults that dip toward the middle of the valley. This fault trough contains unconsolidated deposits of clay, sand, and gravel whose thickness is more than 600 feet. These materials are stream and lake deposits and in places are well sorted and stratified. The lake sediments were laid down in a small lake that occupied Ogden Valley and that was connected with glacial Lake Bonneville at its high stage by an arm of water that occupied Ogden Canyon. During this stage of Lake Bonneville the Ogden Valley was completely filled with lake sediments up to an altitude of about 4900 feet." (8)

> Ogden Valley is a high valley entirely surrounded by mountains and has only one drainage outlet. The main drainage channels of the valley are the North, Middle, and South Forks of the Ogden River, which converge near the west side of the valley just before the river enters the steep, narrow, and rocky Ogden Canyon. Of the three major streams the South Fork contributes the greatest amount of water to Ogden Valley and the Middle Fork the least. Several smaller creeks enter the valley from the surrounding mountains and contribute a considerable amount of water during the spring. Only two or three of these smaller creeks carry an appreciable amount of water during the summer, and all of this is diverted for irrigation within the valley. A few springs that emerge along the foot of the mountains flow throughout the year. The largest are the Patio Spring, which supplies a swimming pool and small summer recreation park, and two or three springs at the head of Liberty Spring Creek. Springs that rise from the valley floor at an altitude of about 4,925 feet constitute the main source of Huntsville Spring Creek, which flows the entire year. The mountains surrounding the valley have steep slopes and sustain varying amounts of vegetation in the form of underbrush and small trees. The valley floor slopes more or less regularly from the north, northeast, and east toward the head of Ogden Canyon. The valley floor has the form of a bench into which the three main tributaries of the Ogden River have cut their small valleys. Near the head of Ogden Canyon the channels of the three tributaries lie about 60 feet below the general benchlike floor of the valley, but farther upstream this distance becomes less and less until

in the upper parts of the valley the channels are only a few feet below the valley floor. Just north of Huntsville a hill composed mainly of gravel and cobbles rises about 70 feet above the valley floor. (9)

Climate.

Ogden Valley has an altitude of about 4,900 to 5,100 feet. The summer is relatively short and moderately cool. The annual precipitation is approximately 20 inches and has varied from 14.73 inches in 1919 to 36.25 inches in 1909. About 12 inches of water fall in the form of snow during the first 5 months of the year and 5½ inches of precipitation falls during the final 3 months of the year. During the 4 months when irrigation is necessary the rainfall is only about 2½ inches.

Records of evaporation kept by the Biological Survey show that 6.31 inches evaporated from a water surface in June 1936; 6.55 in July; 6.97 in August; and 4.66 in September.

Soils.

Ogden Valley cultivated soils extend from the river valleys at about 4,820 feet altitude to the foot hills surrounding the valley floor. All of this land can be placed in Class II as described on page 3, except about 15 per cent which are Class I soils located in the mouths of canyons. There are no Class III soils in Ogden Valley.

General Information of Ogden River System.

The following description of Ogden River is quoted from the annual report of the Ogden River Water Users Association for 1937.

> Ogden River has its source in the northeast portion of Weber County in the Wasatch Mountains at an elevation of 9000 feet. The flow of the river in Ogden Canyon is made up from four main tributaries: South Fork, which begins at Monte Cristo at an elevation of 9000 feet, having a drainage area of 118,556 acres; Middle Fork from the area of La Plata, having a drainage area of 28,288 acres; North Fork from the area on the east of Mt. Ben Lomond, having a drainage area of 44,047 acres; and Wheeler Creek, which comes from the area east of Mt. Ogden, having a drainage area of 10,176 acres.

The river flows in a westerly direction through Weber County a distance of about 30 miles from its source to where it empties into the Weber River. It first passes through what is called Upper Ogden Valley having an elevation of 5000 feet and there the entire stream is used for irrigation, the return flow from this irrigation re-enters the streams just above the Pine View Reservoir from which it is released either through the pipe line or natural channel in Ogden Canyon to again be used for irrigation in lower Weber and Box Elder Counties.

The only reservoir constructed on the Ogden River is the Pine View Reservoir owned and operated by the Ogden River Water User's Association. It is located eight and one-half miles up Ogden Canyon and has a storage capacity of 41,000 acres feet which covers an area of 1,700 acres. Its water supply is furnished by the three main tributaries--South Fork, North Fork, and Middle Fork-- of the Ogden River. Thus it receives practically all of the flood waters available.

Storage was first begun on November 17, 1936, and at the beginning of the 1937 season there were 26,000 acre feet of water in storage, while at the close of the 1937 season there were 9,875 feet in storage to be carried over to 1938.

The Ogden River furnishes water for the Pioneer Power Plant of the Utah Power and Light Company which is located one mile northwest of the mouth of Ogden Canyon. It produces 5000 kilowatts when operating at full capacity of 180 second feet of water under 4400 foot head.

The rights on the Ogden River were established first by the Johnson Decree #530, May 25, 1899; then by the State Engineer's Proposed Determination under court suit Plain City Irrigation Company vs. Hooper Irrigation Company, August, 1924, which as yet has not been made into a final decree; and then by a stipulation between Upper and Lower Valleys and Ogden City as of July 25, 1929 under the above titles suit.

The Pine View Dam together with appurtenant works was completed during the summer of 1937. The water stored was turned over to the water user's association to sell as they saw fit, thus during the summer of 1937 the first water was delivered from the Pine View Reservoir. (10)

Liberty.

A community of 47 farms located on the North Fork of the Ogden River is called Liberty. Water to irrigate 1652 acres of land is diverted from the North Fork of the Ogden River. During the early part

of the season there is ample water and large quantities are used, but as the runoff decreases, crops on much of the bench land suffer. Later in the season, as the flow of the river falls off, an effort is made to maintain a stream flow of 1.72 second feet by again cutting down the number of streams and making the adjustment by a cut in hours per share of stock.

Wild flooding is the method of application used, except in production of row crops, such as potatoes.

Crops produced in Liberty include canning peas, alfalfa, potatoes, and small grain, chiefly barley.

The Liberty Irrigation Company constructed a canal system with 3 almost parallel branches, carrying water from the North Fork of the Ogden River. The company owns 48.76 second feet of water rights on the North Fork and this stock is divided into 16.23 second feet classed as primary water rights and 32.4 second feet classed as secondary water. The flow when at a maximum is divided into 18 streams of 2.7 c.f.s. Primary stock is listed at $100.00 and secondary at $50.00 per share.

There are 12 farm irrigation records which are used as a basis for the study in the Liberty area. Included in this group are records of 3 farms on Class I soil and 9 on Class II soils. The records on Class II soil farms are further divided into Class II-A with 4 farms showing heavy applications of water, and 5 farms in Class II-B indicating rather light irrigations.

Class I soils of the Liberty area occur in and near the mouth of North Fork Canyon. These soils are shallow, sandy, gravely loams underlaid with porous sandy gravel mixtures, carrying a somewhat more silt and clay than the surface soils. The surface soil varies in depth from

a few inches to about 18 inches. Water is applied by the wild flooding method for all grain, alfalfa, and pea crops.

During the early summer there is an abundance of water available and heavy applications are the rule. Alfalfa is first irrigated early in June and usually is given 3 or 4 applications before the second week in July at which time the stream has reached its natural normal flow and other crops need what water is available.

Table 1 shows that alfalfa on farm 55 was irrigated two times with an average application of 4.6 inches depth of water. The root zone of alfalfa is approximately 3 feet in this Class I soil which has an estimated water storage capacity of about 0.8 inches per foot depth of soil. An ideal application under these conditions would be approximately 2.4 inches of water. Farm No. 61 applied water 4 times at an average rate of 13.4 inches; and while almost 4 times more water was used than was applied on the alfalfa on farm 55, the yield of hay was not increased.

Barley on farm 55 was given 22.8 inches of water in one application, which is about 10 times more water than can be stored in the root zone area of this crop on Class I soil. The application of large quantities of water to small grain crops in one or two irrigations seems to be a common practice on both classes of soils in the Liberty Area. Farm 66 used 25 inches of water on barley in one application.

This group of records summarized in table 1 shows no consistently careful irrigators because although one crop on a farm may show careful application of water another is over-irrigated. It would seem that the amount of water used has a close relationship to the supply available.

The yield of crops is not a function of the amount of water applied and there are other factors which enter into the yield of crops besides the total quantity of water used. Soil fertility is probably the foremost

factor in the yield of crops, but climatic conditions, pests, and diseases, also influence crop yields greatly. On the farms whose records show the highest yields are found the large herds of dairy cattle.

There is a group of records which show rather light applications of water on Class II soils and they have been marked by a letter B in table 1. Only one of this group is irrigated from the Liberty Irrigation Company canals; the other 4 obtain water from private springs yielding a steady, uniform flow, or from a canyon where the runoff is of rather short duration and summer flow is small. Another factor which contributes to economy in use of water in this group of light water users, is the fact that the land is of steep gradient and soil erosion must be prevented.

The water storage capacity of the alfalfa root zone area on farms 39 and 43, table 1, is approximately 4.5 inches, while the average application is 6.0 and 6.5, respectively. Alfalfa on farm 39 was irrigated to soil storage capacity once and then the small stream was used on other crops. Alfalfa on farm No. 40 was irrigated five times with light applications which averaged about 50 per cent of the soil storage capacity.

The highest yields of peas are reported on the light irrigated fields except in the case of farm No. 39 which gave a light yield and farm 73 a heavy yield. It should be pointed out that tonnage of peas may have been increased in some cases due to advanced maturity of the crop when harvested.

All of the wheat grown on Class I and Class II soils was over-irrigated except on farm 42. Wheat yields were below normal in 1938 due to rust.

Table 2 shows a summary of the relationship of water applied and storage capacity of the various crop root zones in the two soil classes.

The average storage capacity of Class I soils is about 2.4 inches, while an average of 15.1 inches was applied. This shows a heavy loss of water, and since it runs through the soil, there must be a considerable loss of soil fertility. Yields of all crops on Class I soils shown in the records are comparatively light. Perhaps this continuous heavy application of water over a long period of years is the chief factor in the lack of good crop production. The storage capacity of Class II soils is greater because of two factors: first, a deeper root zone, and second, the increase in water storage capacity per foot depth of soil. Table 2 shows that the crops on the farms included in Class II-A are all over-irrigated, the average soil storage capacity being approximately 4.2 inches of water while the average application of water is 15.2 inches. The 5 light irrigated farms in the Class II-B group show a soil storage capacity of approximately 4.3 inches and an average application of only 3.7.

Eden.

The community of Eden is composed of 60 farms on the North Fork just 3 miles south of Liberty. Irrigated land is largely sandy clay loam Class II soil, is underlaid with clay at a depth of from 5 to 6 feet. The main source of irrigation water is from the North Fork and from Wolf Creek and together serve 2100 acres. Return flow from Liberty into North Fork furnishes practically all of the late water supply. Flood waters from Middle Fork Canyon are used for early irrigation on 318 acres of the bench lands chiefly Class I soil east of the town. Small canyon streams and springs furnish water to irrigate about 200 acres in the Eden area.

Table 1. Summary tabulation by crops of water applications, depth of root zone, and water storage capacity of soils in Liberty area

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS			Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
						No. Of (7)	Total Depth in Inches (8)	Average Inches Applied (9)		
55	I	Alfalfa	28.0	3.0	0.8	2	9.2	4.6	2.4	1½ t
61	I		35.0	3.0	0.8	4	53.6	13.4	2.4	1½ t
66	I		50.0	3.0	0.8	4	10.9	2.7	2.4	1 t
47	IIA		8.0	6.0	1.1	2	18.8	9.4	6.6	3 t
47	IIA		8.0	6.0	1.1	2	14.4	7.2	6.6	3 t
69	IIA		16.8	6.0	1.1	4	65.2	16.3	6.6	3 t
73	IIA		17.0	4.0	1.1	2	26.2	13.1	4.4	3 t
38	IIB		6.0	4.5	1.1	1	16.0	16.0	4.9	1½ t
39	IIB		5.0	4.5	1.1	1	6.0	6.0	4.9	1½ t
40	IIB		18.5	5.0	1.1	5	10.9	2.2	5.5	3 t
43	IIB		5.0	4.5	1.1	2	13.0	6.5	4.9	3 t
		Totals	197.3			29	244.2	8.4		2.3 t
55	I	Barley	2.0	2.6	1.0	1	22.8	22.8	2.6	50 b
61	I		2.0	2.6	1.0	1	4.8	4.8	2.6	39 b
66	I		2.0	2.6	1.0	1	25.0	25.0	2.6	35 b
64	IIA		4.0	4.0	1.1	2	23.6	11.8	4.4	60 b
38	IIB		3.0	4.0	1.1	1	4.0	4.0	4.4	40 b
39	IIB		4.0	4.0	1.1	1	4.5	4.5	4.4	47 b
42	IIB		3.0	4.0	1.1	2	6.3	3.2	4.4	74 b
		Totals	20.0			9	91.0	10.1		49.3

Table 1. (Continued)

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS			Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
						No. Of (7)	Total Depth in Inches (8)	Average Inches Applied (9)		
66	I	Peas	3.0	2.6	0.8	4	51.2	12.8	2.1	1.4 t
47	IIA		3.0	3.0	1.1	2	30.4	15.2	3.3	2.0 t
47	IIA		5.0	3.0	1.1	3	47.8	15.9	3.3	2.0 t
69	IIA		5.0	3.0	1.1	3	24.3	8.1	3.3	1.5 t
73	IIA		4.0	2.5	1.1	3	34.3	11.4	2.7	2.9 t
38	IIB		5.0	3.0	1.1	2	6.7	3.3	3.3	2.6 t
39	IIB		5.0	3.0	1.1	2	9.1	4.5	3.3	1.5 t
40	IIB		3.0	3.0	1.1	3	15.0	5.0	3.3	2.0 t
41	IIB		7.0	3.0	1.1	2	4.4	2.2	3.3	2.7 t
42	IIB		6.0	3.0	1.1	2	6.1	3.0	3.3	2.5 t
43	IIB		3.0	3.0	1.1	3	13.8	4.6	3.3	2.5 t
		Totals	49.0			29	243.1	8.4		2.2 t
61	I	Oats	4.0	2.6	1.0	2	25.4	14.7	2.6	47 b
66	I		4.0	2.6	1.0	1	37.1	37.1	2.6	40 b
69	IIA		3.0	4.0	1.1	2	18.0	9.0	4.4	72 b
73	IIA		5.0	3.5	1.1	2	20.0	10.0	3.8	67 b
41	IIB		10.0	4.0	1.1	2	4.8	2.4	4.4	75 b
42	IIB		3.0	4.0	1.1	2	11.1	5.5	4.4	70 b
43	IIB		5.0	4.0	1.1	3	4.0	1.3	4.4	40 b
		Totals	34.0			14	124.4	8.9		59.7 b
61	I	Wheat	5.0	2.6	0.8	2	26.0	13.0	2.1	32 b
66	I		5.0	2.6	0.8	2	36.7	18.4	2.1	22 b
47	IIA		4.0	3.5	1.1	2	22.8	11.4	3.8	30 b
73	IIA		5.0	3.0	1.1	2	23.3	11.6	3.3	41 b
42	IIB		6.0	4.0	1.1	2	4.6	2.3	4.4	20 b
		Totals	25.0			10	113.4	11.3		29 b

Table 2. Relationship between water applied, soil storage capacity, and crop yields for the different soil classes in Liberty area

Soil Class (1)	Crop (2)	Acres (3)	Approx. Soil Storage Capacity (4)	Approx. Depth of Root Zone In Feet (5)	IRRIGATIONS			Difference Between Columns 4 and 8 (9)	Average Crop Yield Per Acre (10)
					Ave. No. Of (6)	Total Ave. Depth in Inches (7)	Average Inches Applied (8)		
I	Alfalfa	113.0	2.4	3.0	3.3	24.5	7.4	5.0	1.3 t
	Barley	6.0	2.6	2.6	1.0	17.5	17.5	14.9	41 b
	Wheat	10.0	2.1	2.6	2.0	31.3	15.7	13.6	27 b
	Oats	8.0	2.6	2.6	1.5	33.2	22.1	19.5	43.5 b
	Peas	3.0	2.1	2.6	4.0	51.2	12.8	10.7	1.4 t
	Totals	140.0	2.4	2.7	2.4	31.5	13.1	10.7	None
IIA	Alfalfa	49.8	6.0	5.5	2.5	31.1	12.4	6.4	3 t
	Peas	17.0	3.1	2.9	2.7	24.2	9.0	5.9	2.2 t
	Wheat	9.0	3.5	3.2	2.0	23.0	11.5	8.0	35.5 b
	Barley	7.0	4.4	4.0	2.0	50.6	25.3	20.9	60 b
	Oats	8.0	4.1	3.7	2.0	38.0	19.0	14.9	69.5 b
	Totals	90.8	4.2	3.9	2.2	33.4	15.2	11.0	None
IIB	Alfalfa	34.5	5.0	4.6	2.2	11.5	5.2	0.2	2.2 t
	Barley	10.0	4.4	4.0	1.3	4.9	3.8	-0.6 1/	53.7 b
	Peas	29.0	3.3	3.0	2.3	9.2	4.0	0.7	2.3 t
	Oats	18.0	4.4	4.0	2.3	6.6	2.9	-1.5	61.7 b
	Wheat	6.0	4.4	4.0	2.0	4.6	2.3	-2.1	20 b
	Totals	97.5	4.3	3.9	2.0	7.4	3.7	-0.6	None

1/ The minus sign in column 9 indicates that the average application was less than the soil storage capacity.

The heavy application of water on the land in the Liberty area has a direct bearing on the return flow to the North Fork channel directly above the Eden Canal head gates. This condition needs investigation to determine the location of unfarmed area which might be used for recharge purposes to hold back a larger portion of the North Fork early runoff. Previous tables indicate that excessive amounts of irrigation water are applied to the land served by the Liberty Irrigation Company canal system. The careful irrigation of these higher lands would cause less return flow for use on the farms of Eden.

The Eden Irrigation Company canal was built at an original cost of $4,061.27 and was set up on a par value of $1.00 per share of stock, which is now valued at $12.50 per share. It is generally recognized by Eden farmers that 2 shares of water will irrigate 1 acre of land. Assessments for overhead and maintenance in 1936 was 25 cents per share of stock.

Six farm irrigation records are used in table 3 to show how Eden farmers use the available water supply. The supply of water during the months of June and July is limited only by the capacity of the canal.

This group of 6 farm records shows an unusual uniformity of application. This is strikingly important when a comparison is made with the records of the Liberty area. If the alfalfa root zone is about 5 feet in depth and the water storage capacity of the soil is approximately 1.1 inches of water per foot depth of soil, the total storage capacity would be 5.5 inches. Table 3 shows that the average application on alfalfa was 4 inches on farm 25. The maximum was 6.4 inches and the minimum 2.2 inches.[1/] Farm 55 records 2 fields of alfalfa, one of which was 8 acres in area and the other 20 acres. The 8-acre field received 8.1 total inches in 2 irrigations, while the 20-acre field was irrigated 7 times

1/ See detail table in appendix.

with a total application of 22.7 inches. Both fields are reported to have yielded 3 tons per acre. Probably some subbing occured on the 8-acre field to make more water available than is shown on this record.

Farm 27 applied a total of 18.6 inches in two irrigations to 3 acres of barley. The storage capacity of the barley root zone, a depth of 4 feet is about 4.4 inches of water. The detail record shows an application of 11.1 inches the first irrigation which is excessive and may have been due to the necessity of night irrigation. Farm 27 also used more water on peas than was necessary; each of 3 fields of peas was irrigated 2 times with respective total inches applied of 24.1, 16.1, and 10.3. Yields of peas from these fields could not be separately reported due to the system of harvest used.

Table 3 also shows that farm 29 reports 47.9 inches total depth of water applied in 10 applications to pasture, with an average of 4.7 inches per irrigation. The soil is similar to that of other fields on the farm and locality. This farm record shows that oats received 4.9 inches averages per application and peas 4.4 inches per irrigation.

Table 4 shows the approximate water storage capacity of Class II soil and the average application of water in the Eden area. Alfalfa was irrigated an average of 5 times with 3.6 inches applied and yielded 3.5 tons of hay. Liberty irrigators applied 12.5 inches per application of Class II soil and obtained a 3-ton yield. Barley yields in Eden are 70 bushels with 6.3 inches applied, while at Liberty 25.3 inches gave a yield of 60 bushels. The group on Class II soils of Eden may properly be compared with the heavy irrigators on Class II soils in Liberty because soil, water available, and crops are similar. Alfalfa, barley, and wheat yields are larger in Eden, while peas and oats excel in Liberty. Oats in Liberty yielded 69.5 bushels on 38 inches of water while in Eden

Table 3. Summary tabulation by crops of water applications, depth of root zone, and water storage capacity of soils in Eden area

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS			Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
						No. Of (7)	Total Depth in Inches (8)	Average Inches Applied (9)		
25	II	Alfalfa	3.0	5.0	1.1	6	24.0	4.0	5.5	4 t
35	II		8.0	5.0	1.1	2	8.1	4.0	5.5	3 t
35	II		20.0	5.0	1.1	7	22.7	3.2	5.5	3 t
		Totals	31.0			15	54.8	3.7		3.3 t
22	II	Barley	4.0	4.0	1.1	2	7.9	3.9	4.4	45 b
27	II		3.0	4.0	1.1	2	18.6	9.3	4.4	90 b
27	II		2.0	4.0	1.1	1	6.5	6.5	4.4	90 b
55	II		7.0	4.0	1.1	2	10.0	5.0	4.4	55 b
		Totals	16.0			7	43.0	6.1		70 b
22	II	Peas	2.0	3.0	1.1	3	16.1	5.4	3.3	1½ t
25	II		4.0	3.0	1.1	3	22.2	7.4	3.3	2⅛ t
27	II		5.0	3.0	1.1	2	24.0	12.0	3.3	2 t
27	II		3.0	3.0	1.1	2	16.1	8.0	3.3	2 t
27	II		2.0	3.0	1.1	2	10.3	5.1	3.3	2 t
29	II		4.0	3.0	1.1	3	13.2	4.4	3.3	1.8 t
35	II		12.5	3.0	1.1	3	9.3	3.1	3.3	1½ t
35	II		8.5	3.0	1.1	4	12.4	3.1	3.3	1½ t
55	II		8.0	3.0	1.1	5	28.0	5.6	3.3	1½ t
		Totals	49.0			27	151.6	5.6		1.6 t
29	II	Pasture	8.5	3.0	1.3	10	47.9	4.7	3.9	

Table 3. (Continued)

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS			Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
						No. Of (7)	Total Depth in Inches (8)	Average Inches Applied (9)		
22	II	Oats	3.0	4.0	1.1	2	10.8	5.4	4.4	50 b
27	II		3.0	4.0	1.1	2	14.5	7.2	4.4	78 b
29	II		4.0	4.0	1.1	3	14.6	4.9	4.4	65 b
55	II		5.0	4.0	1.1	4	22.3	5.6	4.4	60 b
		Totals	15.0			11	62.2	5.7		63 b
25	II	Wheat	3.0	4.0	1.3	3	17.7	5.9	5.2	50 b
29	II		2.0	4.0	1.3	2	11.4	5.7	5.2	31 b
		Totals	5.0			5	29.1	5.8		40.5 b
25	II	Beetseed	4.0	4.0	1.1	5	22.3	4.5	4.4	1½ t
27	II		3.0	4.0	1.1	6	18.2	3.0	4.4	1½ t
		Totals	7.0			11	40.5	3.7		1½ t

Table 4. Relationship between water applied, soil storage capacity, and crop yields for the different soil classes in Eden area

Soil Class (1)	Crop (2)	Acres (3)	Approx. Soil Storage Capacity (4)	Approx. Depth of Root Zone In Feet (5)	IRRIGATIONS			Difference Between Columns 4 and 8 (9)	Average Crop Yield Per Acre (10)
					Ave. No. Of (6)	Total Ave. Depth in Inches (7)	Average Inches Applied (8)		
II	Alfalfa	31.0	5.5	5.0	5.0	17.9	3.6	-1.9	3.3 t
	Barley	21.0	4.4	4.0	1.7	10.7	6.3	1.9	70 b
	Beet Seed	7.0	4.4	4.0	5.5	20.2	3.7	-0.7	63 b
	Oats	15.0	4.4	4.0	2.7	15.5	5.7	1.3	63 b
	Pasture	8.5	3.9	3.0	10.0	47.9	4.8	0.9	None
	Peas	49.0	3.3	3.0	3.0	16.8	5.6	2.3	1.6 t
	Wheat	5.0	5.2	4.0	2.5	14.5	5.8	0.6	40.5 b
	Totals	136.5	4.4	3.9	4.3	20.5	4.8	0.4	None

the yields was 63 bushel on 15.5 inches of water. Wheat yielded 40.5 bushel in Eden with a total of 14.5 inches of water while in Liberty the yield was 35.5 bushel at a cost of 23 inches of water.

Crops do not yield in proportion to the amount of water used in their production, as is shown in table 3. Peas on farm No. 25 yielded heavier with 22.2 inches of water than they did on farm No. 27 with 24 inches of moisture. Farm No. 35 yielded 1½ tons of peas by use of 9.3 inches, while No. 55 produced a like yield on 3 times as much water as farm 35. The same is true of barley, because 90 bushels were produced on one field with 6.5 inches, and on another field the same yield was obtained when 18.6 inches were applied. This might be used to illustrate the law of diminishing returns. The pea crop on the 6 farms of the group was produced with an average of 16.8 inches of water while beet seed was given 20.4 inches; oats 14.9; and alfalfa 10.8 inches.

There are no irrigation records on Class I soils in Eden; therefore, a comparison by soil classes cannot be made. If pasture is removed from this table the total water applied per season averages 15.8 inches. The pasture was irrigated 10 times with an average application of 4.8 inches, which is rather heavy because grass roots more shallowly than other crops. While the total water applied to barley, oats, and wheat looks reasonable, the average per application is ample to fill the soil storage capacity in the Eden soils. Over-irrigation of grain and peas is quite general on the farms of Ogden Valley.

Huntsville.

Huntsville consists of 128 farms located in the south end of Ogden Valley on the South Fork of the Ogden River. Three thousand five hundred and twenty-one acres are served by 9 canals, all but one having their

sources of water from the south Fork of the Ogden River. The supply is limited to the capacity of the distribution systems until about the 15th of July when the size of the streams drops rapidly. The flooding method of application is used on all crops except potatoes.

The soil in the mouth of South Fork Canyon and within about 2 miles east of Huntsville is mostly Class I, and near the town and to the north of Huntsville in Class II.

The south fork of the Ogden River has cut a valley about half a mile wide and 80 feet deep in the southwest part of Ogden Valley area, a part of which is now occupied by the south arm of the Pine View Reservoir. This valley widens and becomes shallow gradually toward the east until within 1 mile from the mouth of the canyon it is not noticeable and two river channels have been cut in the gravel deposits in the mouth of the canyon. The land of the floor of this river valley is composed of Class I soil. 1/

Eleven farm irrigation records have been selected from a total of 14 as most typical for a basis of study of irrigation in the Huntsville area. Five of these are farms having Class I soils and 6 are located on Class II soils. In this first group there is a variation from very shallow gravelly sandy loam soil, to shallow sandy clay loam soil, all underlaid with corase sandy gravel and cobble rock deposits of unknown depth. These Class I soils cover an area, in the mouth of South Fork Canyon, extending for about 2 miles westward at which point there occurs a gradual change from Class I soil to Class II soils. At this point of change the Class I soils become deeper and less gravelly with more organic matter, and the Class II soil carries considerable fine gravel. At or near the border of this change in soil classes there is a bed of clay approximately 5 to 7 feet below the surface, and its east fringe is

1/ See map on page

thought to extend in a semi-circle from the hills on the south to about the center of the town of Eden on the north. It dips at an angle of about 2 degrees toward the west and makes contact with the eastern slope of the mountain which forms the west side of the valley. Water entering the gravel above this clay stratum recharges the artesian reservoir, while surplus water on top of this clay bed finds its way back in to the stream channels.

The water storage capacity of Class I soil of the Huntsville area is comparatively low, averaging approximately 0.8 inches per foot depth to soil. Alfalfa root zone is about 3 feet while the rooting zone of grain and peas is near 2.5 feet on the farms whose records are summarized in table 5. If soil storage capacity and root zone depth are correctly analyzed, the alfalfa on farm 26 was very carefully irrigated, the seasonal use of irrigation water being 30.3 inches.

Farm 82 records show that alfalfa was irrigated 12 times with application averaging 4.3 and a seasonal total of 55.5 inches. The storage capacity is 2.4 and the loss is about 50 per cent. Farm 86, if reported correctly, is indeed remarkable in that such small application can be made on Class I soil of the shallow depth.

Irrigation of alfalfa on the farms on Class II soil shown in table 5 is the nearest approach to the ideal from the viewpoint of average inches applied per irrigation compared with the soil storage capacity in the root zone area. These records bear out the general idea of farmers of the Huntsville area that alfalfa should be irrigated less than other crops. Also the production of two crops of hay makes it possible to discontinue irrigation of alfalfa when the second crop is matured.

Table 5 shows further that peas were over irrigated on all farms on Class I soil. Farm 2 irrigated peas 4 times and applied a total of

Table 5. Summary tabulation by crops of water applications, depth of root zone, and water storage capacity of soils in Huntsville area

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS No. Of (7)	IRRIGATIONS Total Depth in Inches (8)	IRRIGATIONS Average Inches Applied (9)	Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
26	I	Alfalfa	8.0	3.0	0.8	9	30.3	3.4	2.4	2⅓ t
32	I		6.0	3.0	0.8	20	35.5	1.8	2.4	2 t
82	I		35.0	3.0	0.8	12	55.5	4.6	2.4	2½ t
86	I		18.0	3.0	0.8	8	16.6	2.1	2.4	3 t
86	I		19.0	3.0	0.8	7	6.8	1.0	2.4	3 t
00	II		2.5	4.0	1.0	4	10.0	2.5	4.0	3 t
00	II		8.0	4.0	1.0	6	14.6	2.4	4.0	3 t
03	II		12.5	5.0	1.1	8	33.1	4.1	5.5	4 t
07	II		4.0	4.0	1.1	6	18.3	3.0	4.4	5¼ t
14	II		6.0	5.0	1.1	5	32.0	6.4	5.5	4 t
19	II		20.0	4.0	1.1	6	14.4	2.4	4.4	3 t
22	II		37.0	5.0	1.1	5	18.4	3.7	5.5	3½ t
		Totals	176.0			96	285.5	3.0		3.1 t
00	II	Barley	7.0	4.0	1.0	4	8.1	2.0	4.0	63 b
22	II		5.0	4.0	1.1	3	13.2	4.4	4.4	67 b
		Totals	12.0			7	21.3	3.0		65 b
02	I	Peas	1.5	2.5	0.8	4	48.2	12.0	2.0	1 t
26	I		5.0	2.5	0.8	5	26.7	5.3	2.0	1.5 t
32	I		3.0	2.5	0.8	6	46.0	7.7	2.0	1.5 t
86	I		1.0	2.5	0.8	6	36.5	6.1	2.0	1.7 t
03	II		2.5	3.0	1.1	3	12.5	4.2	3.3	1.3 t
07	II		2.0	3.0	1.0	3	12.1	4.0	3.0	2.2 t
14	II		5.0	3.0	1.0	3	19.9	6.6	3.0	1.5 t
22	II		3.5	1.0	1.0	4	19.6	4.9	3.0	1.5 t
		Totals	23.5	3.0	1.0	34	221.5	6.5		1.5 t

Table 5. (Continued)

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS			Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
						No. Of (7)	Total Depth in Inches (8)	Average Inches Applied (9)		
07	II	Oats	1.0	4.0	1.0	5	18.5	3.7	4.0	55 b
14	II		5.0	4.0	1.1	2	16.6	8.3	4.4	90 b
		Totals	6.0			7	35.1	5.0		72 b
02	I	Wheat	2.0½	2.5	0.8	2	23.6	11.8	2.0	35 b
02	I		1.5	2.5	0.8	2	9.3	4.6	2.0	35 b
03	II		3.0	4.0	1.1	2	10.2	5.1	4.4	45 b
		Totals	6.5			6	43.1	7.2		38 b
00	II	Potatoes	2.0	4.0	1.0	3	9.9	3.3	4.0	135 b
03	II		1.0	4.0	1.1	6	23.4	3.9	4.4	112 b
14	II		1.0	4.0	1.1	3	10.9	3.6	4.4	75 b
22	II		2.5	4.0	1.1	3	18.7	6.2	4.4	118 b
		Totals	6.5			15	62.9	4.2		110 b
26	I	Pasture	5.0	2.0	1.0	9	23.6	2.6	2.0	None
32	I	Orchard	2.0	3.0	0.8	12	81.2	6.8	2.4	None

Table 6. Relationship between water applied, soil storage capacity, and crop yields for the different soil classes in Huntsville area

Soil Class (1)	Crop (2)	Acres (3)	Approx. Soil Storage Capacity (4)	Approx. Depth of Root Zone In Feet (5)	IRRIGATIONS			Difference Between Columns 4 and 8 (9)	Average Crop Yield Per Acre (10)
					No. Of (6)	Total Depth in Inches (7)	Average Inches Applied (8)		
I	Alfalfa	86.0	2.4	3.0	11.3	37.9	3.4	1.0	2.5 t
	Orchard	2.0	2.4	3.0	12.0	81.2	6.8	4.4	None
	Pasture	5.0	2.0	2.0	9.0	23.6	2.6	0.6	None
	Peas	10.5	2.0	2.5	5.2	39.3	7.6	5.6	1.4 t
	Wheat	3.5	2.0	2.5	2.0	16.4	8.2	6.2	35 b
	Totals	107.0	2.2	2.6	7.9	39.7	5.0	2.8	None
II	Alfalfa	90.0	4.8	4.4	5.7	20.1	3.5	-1.3	3.7 t
	Barley	12.0	4.2	4.0	3.5	10.6	3.0	-1.2	65 b
	Oats	6.0	4.2	4.0	3.5	17.5	5.0	0.8	72.5 t
	Peas	13.0	3.1	3.0	3.2	16.0	5.0	1.9	1.6 t
	Potatoes	6.5	4.3	4.0	3.7	16.0	4.3	0.0	110 b
	Wheat	3.0	4.4	4.0	2.0	10.2	5.1	0.7	45
	Totals	130.5	4.2	3.9	3.6	15.1	4.2	0.0	None

48.2 inches, and the average application was 12.0 inches of water, while the soil water storage capacity was only 2.0 inches for the pea root zone. There seems to be no direct relationship between the amount of water applied and the yields of the pea crop.

In general it may be pointed out that the application of water on Class II soils of Huntsville approaches the ideal, for table 6 shows that all crops on Class I soils were over irrigated, while all crops on Class II soil, except peas, were irrigated with less water than the soil storage capacity.

Summary of Ogden Valley Division.

A total of 29 farm irrigation records was used in this study to show how water was applied to 689.3 acres of crops in Ogden Valley. The approximate water storage capacity of soils was determined and compared with the average application. Table 8 shows that there were 380 separate irrigations and that 216.6 or 57 per cent exceeded the soil storage capacity, and that 163.4 or 43 per cent of the irrigations were less than the soil storage capacity. Table 8, column 6 shows that 100 per cent of the total application on Class I soil in the Liberty area were excessive, while only 77 per cent of irrigations on Huntsville Class I soil exceeded the soil storage capacity. This indicates a more careful use of water by Huntsville farmers.

Referring again to table 8, all of the 38 irrigations of Group A on Class II soil in the Liberty area were excessive, while Group B on Class II soil shows that only 59 per cent of the applications were greater than storage capacity. In Eden 75 per cent of the applications were excessive as compared to 41 per cent in the Huntsville area.

These data indicate that a more efficient irrigation practice is being followed in the Huntsville area than in the Liberty and Eden areas.

Table 9 shows that excessive applications were applied more frequently to pasture and grain than to alfalfa, sugar beet seed and potatoes. Sugar beet seed and potatoes are irrigated by the farrow method which permits a better control of the water applied. Pasture and grain, on the other hand, are irrigated by wild flooding, which method is less efficient than by furrows. Alfalfa is also irrigated by wild flooding but inasmuch as it is a perennial, when water supplies are short the annual crops are favored with a resulting smaller application to the alfalfa.

Table 9 shows further that the total water used during the season varied from 14.1 inches on barley to 81.2 inches on a 2-acre orchard located on shallow Class I soil. Pasture, peas, and alfalfa were given 30, 22.2 and 23.6 inches respectively. Seasonal application to the grain crops were not too heavy but the irrigations were not sufficiently frequent to maintain optimum water in the soil.

Table 8. Summary of numbers of farms, crop acreage, total applications and per cent of applications above and below the estimated water storage capacity of the Ogden Valley soils

Town (1)	No. of Farms (2)	Soil Class (3)	Total Acres (4)	Total No. of Applications (5)	Per Cent App. Over Soil Capacity (6)	Per Cent App. Under Less Than Soil Capac. (7)
Liberty	3	I	140.0	22	100	0
	4	IIA	91.8	38	100	0
	5	IIB	87.5	36	59	41
Eden	6	II	131.5	86	75	25
Huntsville	5	I	108.0	114	77	23
	6	II	130.5	84	41	59
Total	29		669.3	380	57 or 216.6 App.	43 or 163.4 App.

Table 9. Summary of crop acreage and yields, average number of applications, total depth applied, upper valley, and percentage of application over and under the soil storage capacity in Ogden Valley

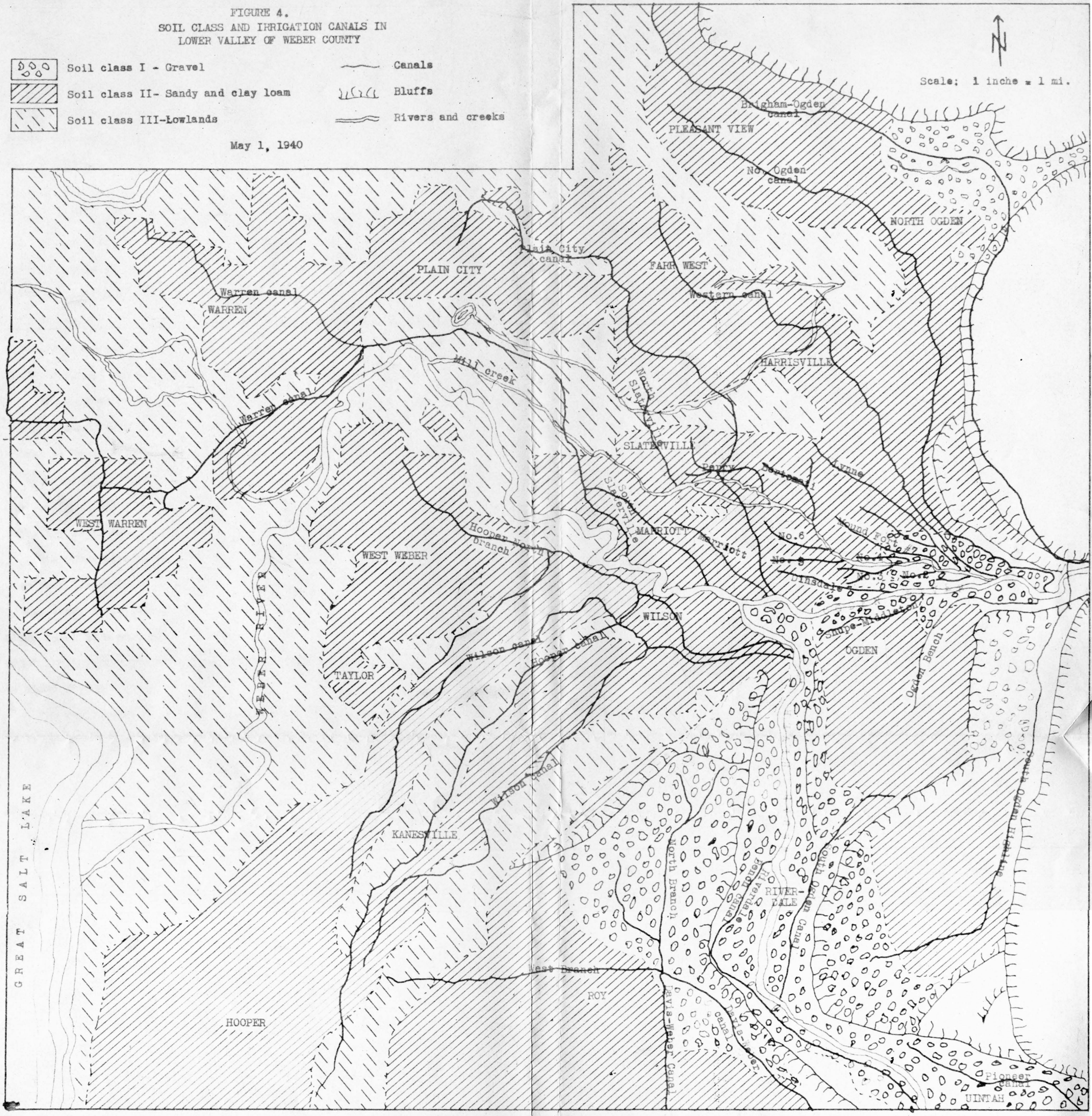
Crop (1)	Total Acres (2)	Ave. No. App. (3)	Ave. Total Depth In Inches (4)	Per Cent App. Over Cap. (5)	Per Cent App. Under Cap. (6)	Ave. In. App. (7)	Ave. Yield (8)
Alfalfa	404.3	5.3	23.6	57.7	42.3	5.0	2.9 T
Barley	56.0	2.2	14.1	61.5	38.5	8.1	61.9 B
Oats	55.0	3.2	16.9	76.9	23.1	6.5	54.9 B
Peas	121.5	3.3	22.2	82.1	17.9	6.8	1.8 T
Potatoes	6.5	3.7	15.7	75.0	25.0	4.2	110.0 B
Wheat	36.5	2.2	17.2	90.0	10.0	8.1	35.8 B
Pasture	13.5	9.5	36.6	100.0	0.0	3.6	-
Orchard	2.0	12.0	61.2	100.0	0.0	6.7	-
Beet Seed	7.0	5.5	20.2	0.0	100.0	3.7	1.5 T
Total	689.3	4.1	22.05	57.0	43.0	5.7	

FIGURE 4.
SOIL CLASS AND IRRIGATION CANALS IN
LOWER VALLEY OF WEBER COUNTY

Soil class I - Gravel
Soil class II- Sandy and clay loam
Soil class III-Lowlands

Canals
Bluffs
Rivers and creeks

May 1, 1940



LOWER VALLEY OF WEBER COUNTY

The entire flow of the South Fork, Middle Fork and North Fork of the Ogden River and the other smaller streams into Ogden Valley is diverted for irrigation purposes during the summer months. Return flow into the stream channels is stored in Pine View Reservoir. Flow from side canyons into Ogden River through Ogden Canyon augmented by an equal flow to that entering the reservoir and released storage water makes up the flow of Ogden River entering the lower valley where it is diverted into 16 separate canal systems. Storage water for the Ogden-Brigham highline canal and the South Ogden highline canal is diverted from the Pine View dam to the mouth of the canyon through a 72 inch aqueduct which also carries water to operate the Pioneer Plant of the Utah Power and Light Company. About 13,000 acres of land are irrigated from Ogden River.

The portion of Weber County known as the Lower Valley is a 13-mile strip of land which lies west of the Wasatch Range of mountains to the shores of Great Salt Lake, an average distance of 15 miles. Ogden City occupies about 17 square miles of land adjoining the foot of Mount Ogden near the east center of the area. Rural communities are located north, west, and south of Ogden.

The Weber River enters the southeast corner of this lower Weber County area from the mouth of Weber Canyon and flows west 4 miles, then north 5 miles, where it is joined by the Ogden River to form the lower Weber River which flows in a westerly direction to the Lake. There are 10 main canals and 7 pumping plants diverting water from the Weber River for irrigation of about 28,000 acres of farmland.

Six small mountain streams enter the valley from the canyon and foothill springs along the Wasatch Range. These streams irrigate about 310

acres and artesian wells are used to irrigate about 175 acres of land in the lower areas of the valley.

Riverdale.

There are 82 farms in the Riverdale area with an average of 16½ acres per farm. This area is located along the main State highway and is adjacent to the south and west borders of Ogden City. Water for irrigation purposes comes from the Weber River through the Riverdale Bench Canal and the Davis-Weber Canal system.

The soil in the Riverdale area is practically all Class I. The soil in the river valley carries more organic matter than that on the adjacent benches and is chiefly fine sandy loam and sandy gravelly loam ranging in depth from a few inches to about 3 feet and underlaid with coarse material to an unknown depth. The water table fluctuates as the river rises and falls. Over most of the river valley area the water table is about 3 to 5 feet below the surface.

Benchland soils are sandy loam in character and are quite gravelly below the first 12 inches of surface. As it increases in depth, the soil becomes more sandy and gravelly, turning into almost straight gravel of 3 feet. Crops grown in this area consist chiefly of alfalfa, berries, tomatoes, and fruit.

The wild flooding method of irrigation is used on all crops except fruit, potatoes, and sugar beets. Outstanding in the irrigation practice in this area is the fact that the application of water per irrigation is reasonably light when compared with the water storage capacity of the soil which is approximately 0.9 inches of water per foot depth of soil. The alfalfa root system penetrates from 3½ to 5 feet in the sandy gravelly soil on the benchland soils in Riverdale, and from 3 to 4 feet in the

river valley soils. The bench land soils have a water storage capacity of approximately 0.8 inches per foot depth of soil and the river valley soils store about 0.9 inches per foot depth. On this basis all of the alfalfa fields on which records were obtained were irrigated with slightly more water per application than the water storage capacity of the soil. For instance, on farm No. 35 of table 10 the record shows that 34.5 inches of water were applied on alfalfa and that the water holding capacity of the soil in the root zone area is approximately 3.2 inches and that 7 applications of water were made with an average of 4.9 inches per application. Farm 39 irrigated alfalfa under similar conditions with an average application of 2.9 inches. Just how much water the alfalfa in the Riverdale district used from underground sources cannot be determined, but judging from the irrigation records it must have obtained a considerable amount.

A further study of records compiled in table 10 shows that the orchards of Riverdale, of which there are 139 acres, were very carefully irrigated. The exact depth of the roots of these orchard trees penetrate into Class I soil is not known, but assuming that it is 3 feet and that the soil capacity is approximately 0.8 inches per foot depth of soil, 7 received less water than the soil storage capacity, 4 slightly more than capacity, and 2 were over irrigated. The average number of applications of water to these orchards is 11½ and the average total inches applied to the entire acreage is 27.2 inches, which is an average of 2.5 inches per application. On the assumption of root penetration and water storage capacity of this soil stated above, the total water storage capacity would be about 2.4. Assuming this to be a fact, the majority of these records show that they are well within the range of economical use of irrigation

Table 10. Summary tabulation by crops of water applications, depth of root zone, and water storage capacity of soils in Riverdale area

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS			Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
						No. Of (7)	Total Depth in Inches (8)	Average Inches Applied (9)		
35	I	Alfalfa	2.0	4.0	0.8	7	34.5	4.9	3.2	4 t
39	I		7.0	3.0	0.8	7	20.1	2.9	2.4	5 t
58	I		4.0	3.5	0.9	4	16.3	4.1	3.1	5½ t
65	I		4.0	3.0	0.8	6	16.9	2.8	2.4	6 t
65	I		3.0	3.0	0.8	6	20.1	3.3	2.4	6 t
77	I		3.5	3.0	0.9	16	59.1	3.7	2.7	3 t
		Totals	23.5	3.2	0.8	46	167.0	3.6	2.7	4.9 t
77	I	Barley	2.0	3.0	0.9	6	27.9	4.6	2.7	30 b
		Totals	2.0	3.0	0.9	6	27.9	4.6	2.7	30 b
09	I	Peas	2.0	3.0	0.8	3	14.1	4.7	2.4	1½ t
35	I		1.5	3.0	0.9	5	19.2	3.8	2.7	1.9 t
		Totals	3.5	3.0	0.8	8	33.3	4.2	2.5	1.7 t
65	I	Oats	3.0	3.0	0.8	2	13.9	6.9	2.4	90 b
		Totals	3.0	3.0	0.8	2	13.9	6.9	2.4	90 b
09	I	Potatoes	4.0	3.0	1.2	5	15.0	3.0	3.6	122 b
		Totals	4.0	3.0	1.2	5	15.0	3.0	3.6	122 b
58	I	Sugar beets	2.0	3.5	0.9	7	25.4	3.6	3.1	22 t
		Totals	2.0	3.5	0.9	7	25.4	3.6	3.1	22 t
10	I	Onions	15.0	3.0	0.9	22	29.7	1.4	2.7	200 cwt
		Totals	15.0	3.0	0.9	22	29.7	1.4	2.7	200 cwt

Table 10. (Continued)

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS No. Of (7)	IRRIGATIONS Total Depth in Inches (8)	IRRIGATIONS Average Inches Applied (9)	Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
09	I	Orchard	3.0	4.0	0.9	4	15.8	3.9	3.6	---
09	I		3.0	4.0	0.9	4	15.0	3.7	3.6	---
11	I		14.0	3.0	0.8	11	37.7	3.4	2.4	---
11	I		16.0	3.0	0.8	12	30.5	2.5	2.4	---
11	I		25.0	3.0	0.8	14	33.4	2.4	2.4	---
13	I		9.0	3.0	0.9	18	23.9	1.3	2.4	---
33	I		7.0	3.0	0.8	13	12.1	0.9	2.4	---
35	I		8.0	3.0	0.8	17	33.5	2.0	2.4	---
39	I		14.0	3.0	0.8	6	25.9	4.3	2.4	---
65	I		1.0	3.0	0.8	3	19.9	6.6	2.4	---
76	I		4.0	3.0	0.8	16	42.8	2.7	2.4	---
77	I		5.0	3.0	0.8	8	14.3	1.8	2.4	---
77	I		5.0	3.0	0.8	15	31.8	2.1	2.4	---
77	I		5.0	3.0	0.8	12	25.9	2.2	2.4	---
84	I		20.0	3.0	0.8	17	55.7	3.3	2.4	---
		Totals	139.0	3.1	0.8	170	418.2	2.5	2.6	---
11	I	Berries	2.0	3.0	0.8	11	30.4	2.8	2.4	---
11	I		2.0	3.0	0.8	11	26.6	2.4	2.4	---
77	I		1.0	3.0	0.8	4	7.5	1.9	2.4	---
		Totals	5.0	3.0	0.8	26	64.5	2.5	2.4	---
33	I	Melons	1.0	3.0	0.8	11	14.0	1.3	2.4	---
76	I		2.0	3.0	0.8	15	42.0	2.8	2.4	---
		Totals	3.0	3.0	0.8	26	56.0	2.2	2.4	---
35	I	Tomatoes	2.0	3.0	0.8	12	39.9	3.3	2.4	12 t
39	I		6.0	3.0	0.8	7	20.7	3.0	2.4	12 t
76	I		3.0	3.0	0.8	12	42.3	3.5	2.4	10 t
		Totals	11.0	3.0	0.8	31	102.9	3.3	2.4	11.3 t

Table 11. Relationship between water applied, soil storage capacity, and crop yields for the different soil classes in Riverdale area

Soil Class (1)	Crop (2)	Acres (3)	Approx. Soil Storage Capacity (4)	Approx. Depth of Root Zone In Feet (5)	IRRIGATIONS No. Of (6)	IRRIGATIONS Total Depth in Inches (7)	IRRIGATIONS Average Inches Applied (8)	Difference Between Columns 4 and 8 (9)	Average Crop Yield Per Acre (10)
I	Alfalfa	23.5	2.7	3.2	46	167.0	3.6	0.9	4.9 t
	Barley	2.0	2.7	3.0	6	27.9	4.6	1.9	30 b
	Berries	5.0	2.4	3.0	26	64.5	2.5	0.1	---
	Melons	3.0	2.4	3.0	26	56.0	2.2	-0.2	---
	Oats	3.0	2.4	3.0	2	13.9	6.9	4.5	90 b
	Onions	15.0	2.7	3.0	22	29.7	1.4	-1.3	200 cwt
	Orchard	139.0	2.6	3.1	170	418.2	2.5	-0.1	---
	Peas	3.5	2.5	3.0	8	33.3	4.2	1.7	1.7 t
	Potatoes	4.0	3.6	3.0	5	15.0	3.0	-0.6	122 b
	Sugar beets	2.0	3.5	3.5	7	25.4	3.6	0.5	22 t
	Tomatoes	11.0	2.4	3.0	31	102.9	3.3	0.9	11.3 t
	Totals	211.0	2.7	3.1	349	953.8	2.7	0.0	None

water. Other crops including barley, beets, peas, oats, berries, melons, potatoes, and onions have been irrigated with the same careful application of water with very few exceptions.

Roy.

The community of Roy, located in the center of the south portion of Weber County on the Ogden-Salt Lake Highway 6 miles southwest of Ogden City, is composed of about 75 farms which are larger than 10 acres in area. It has about 2210 acres of cultivated land, all of which is irrigated from the waters of the Weber River through the Davis-Weber Canal system.

The soil of this district is about 50 per cent Class I and 50 per cent Class II. The Class I soils of Roy are very similar in character to the Class I soils of Riverdale. In fact, Riverdale and Roy districts are adjacent. The crops produced on the Class I soil of Roy consists of alfalfa, peas, tomatoes, melons, and fruit. Alfalfa is irrigated somewhat oftener and with more water than that in the Riverdale area. This may be due to the fact that the Class I soils of Roy have no water table within reach of the root zone of crops.

A study of the records of 154 acres of orchard land shows very careful application of water so far as the average application of water is concerned. The total average depth applied during the 1938 season was 40 inches, while the average application was 2.7 inches. Assuming the orchard tree root zone to be an average of 3 feet in depth in the Class I soils and that the storage capacity is 0.8 inches per foot depth of soil, the total soil storage capacity is 2.4 inches. Seven orchards out of the 14 shown in table 12 of this study applied more than 2.4 inches of water. The records show that on one orchard of 3 acres there was a total application of 115.5 inches of water and that this water was ap-

plied in 35 irrigations with an average of 3.3 inches per irrigation. Another orchard of 30 acres was irrigated 23 times with a total application of 32.6 inches and an average of 1.4 inches per application. There is such a variation in the age of trees and varieties of fruit that no attempt was made to secure information on the yields of these orchards.

Class II soils in Roy are chiefly sandy loam in texture and range from 3 to 6 feet in depth and are well-drained. The chief crops produced on these soils consist of alfalfa, sugar beets, peas, tomatoes, potatoes, and truck crops. The water storage capacity for this sandy loam soil is approximately 1.0 inch per foot depth of soil. Alfalfa penetrates about 5 feet on the farms on which irrigation records are available. Therefore, the storage capacity for the alfalfa root zone on these farms is approximately 5.0 inches of water.

The record on Farm 1, table 12, shows that alfalfa was irrigated 6 times with an average application of 2.4 inches. On Farm 26 alfalfa was irrigated 4 times with an average application of 1.5 inches. The water table of these two farms stands at 5 feet during the growing season and this would probably account for such a small application of water.

The sugar beet records on three farms show rather light applications of water. On farm 20 they were irrigated 9 times with an average application of 4.4 inches, while on farm 2 sugar beets were produced with an average application of 0.9 in 12 irrigations. The yield reports show that farm 2 produced 35 tons of beets per acre while farm 20 produced 21 tons per acre.

The records on peas grown on Class II soils in Roy show a very wide variation of water usage. Assuming that peas roots penetrate 3 feet into the soil and that the water storage capacity is 1.0 inches per foot depth of soil, the peas on farm 20 were given applications of approximately

Table 12. Summary tabulation by crops of water applications, depth of root zone, and water storage capacity of soils in Roy area

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS No. Of (7)	IRRIGATIONS Total Depth in Inches (8)	IRRIGATIONS Average Inches Applied (9)	Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
18	I	Alfalfa	1.0	4.0	0.8	11	109.5	10.0	3.2	5 t
33	I		5.0	4.0	0.8	7	17.3	2.5	3.2	3 t
46	I		15.0	4.0	0.8	9	33.6	3.7	3.2	4 t
72	I		15.0	4.0	0.8	18	26.6	1.5	3.2	3 t
01	II		5.0	5.0	1.0	6	14.6	2.4	5.0	5 t
01	II		7.0	5.0	1.0	5	11.2	2.2	5.0	5 t
26	II		3.0	5.0	1.0	4	6.1	1.5	5.0	5 t
		Totals	51.0	4.4	0.9	60	217.9	3.6	4.0	4.3 t
04	II	Barley	1.0	4.0	1.3	1	1.0	1.0	5.2	53 b
		Totals	1.0	4.0	1.3	1	1.0	1.0	5.2	53 b
01	II	Sugar beets	6.0	4.0	1.0	6	12.0	2.0	4.0	17 t
02	II		6.0	4.0	1.0	12	11.2	0.9	4.0	35 t
07	II		6.5	4.0	1.0	6	21.1	3.5	4.0	26 t
20	II		7.0	4.0	1.0	9	39.6	4.4	4.0	21 t
		Totals	25.5	4.0	1.0	33	83.9	2.5	4.0	24.7 t
47	I	Berries	3.0	3.0	0.8	14	63.1	4.5	2.4	---
72	I		1.0	3.0	0.8	10	17.2	1.7	2.4	---
72	I		2.0	3.0	0.8	11	24.0	2.2	2.4	---
		Totals	6.0	3.0	0.8	35	104.3	3.0	2.4	---
26	II	Garden	3.0	3.0	1.0	10	14.3	1.4	3.0	---
		Totals	3.0	3.0	1.0	10	14.3	1.4	3.0	---

Table 12. (Continued)

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS			Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
						No. Of (7)	Total Depth in Inches (8)	Average Inches Applied (9)		
53	I	Melons	5.0	3.0	0.8	10	25.8	2.6	2.4	---
72	I		3.0	3.0	0.8	10	29.5	2.9	2.4	---
		Totals	8.0	3.0	0.8	20	55.3	2.8	2.4	---
18	I	Orchard	3.0	3.0	0.8	10	48.0	4.8	2.4	---
18	I		2.0	3.0	0.8	8	33.6	4.2	2.4	---
33	I		3.0	3.0	0.8	35	115.5	3.3	2.4	---
33	I		8.0	3.0	0.8	22	44.1	2.0	2.4	---
33	I		4.0	3.0	0.8	14	47.4	3.4	2.4	---
33	I		4.0	3.0	0.8	12	30.8	2.6	2.4	---
46	I		14.0	3.0	0.8	6	24.1	4.0	2.4	---
46	I		20.0	3.0	0.8	9	29.5	3.3	2.4	---
46	I		7.0	3.0	0.8	8	25.0	3.1	2.4	---
49	I		13.0	3.0	0.8	16	24.6	1.5	2.4	---
51	I		31.0	3.0	0.8	17	41.4	2.4	2.4	---
51	I		5.0	3.0	0.8	20	45.6	2.3	2.4	---
53	I		30.0	3.0	0.8	23	32.6	1.4	2.4	---
72	I		10.0	3.0	0.8	10	18.4	1.8	2.4	---
		Totals	154.0	3.0	0.8	210	560.6	2.7	2.4	---
07	II	Potatoes	1.5	4.0	1.0	5	26.4	5.3	4.0	175 b
15	II		1.5	4.0	1.0	6	15.3	2.5	4.0	125 b
26	II		2.0	4.0	1.0	7	11.4	1.6	4.0	180 b
		Totals	5.0	4.0	1.0	18	53.1	2.9	4.0	160 b

Table 12. (Continued)

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS No. Of (7)	IRRIGATIONS Total Depth in Inches (8)	IRRIGATIONS Average Inches Applied (9)	Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
33	I	Peas	6.0	3.0	0.8	5	13.4	2.7	2.4	2 t
46	I		6.0	3.0	0.8	4	32.2	8.0	2.4	2 t
49	I		3.0	3.0	0.8	4	21.3	5.3	2.4	3/4 t
72	I		4.0	3.0	0.8	3	8.8	2.9	2.4	1½ t
01	II		5.0	3.0	1.0	3	4.4	1.5	3.0	2½ t
02	II		1.5	3.0	1.0	8	19.3	2.4	3.0	1 t
15	II		1.0	3.0	1.0	4	10.8	2.7	3.0	1 t
20	II		3.5	3.0	1.0	4	30.2	7.5	3.0	2 t
		Totals	30.0	3.0	0.9	35	140.4	4.0	2.7	1.6 t
49	I	Tomatoes	3.0	3.0	0.8	13	55.0	4.2	2.4	8 t
72	I		3.0	3.0	0.8	15	79.7	5.3	2.4	8 t
02	II		2.0	4.0	1.0	12	90.5	7.5	4.0	13 t
04	II		3.0	4.0	1.0	5	14.6	2.9	4.0	15 t
07	II		0.5	4.0	1.0	6	95.0	15.8	4.0	15 t
20	II		3.0	4.0	1.0	4	17.1	4.3	4.0	8 t
26	II		2.0	4.0	1.0	3	4.6	1.5	4.0	16 t
		Totals	16.5	3.7	0.9	58	356.5	6.1	3.5	11.9 t
15	II	Wheat	2.5	4.0	1.0	4	15.0	3.7	4.0	56 b
20	II		5.0	4.0	1.0	2	11.7	5.8	4.0	47 b
		Totals	7.5	4.0	1.0	6	26.7	4.4	4.0	51.5 b

Table 13. Relationship between water applied, soil storage capacity, and crop yields for the different soil classes in Roy area

Soil Class (1)	Crop (2)	Acres (3)	Approx. Soil Storage Capacity (4)	Approx. Depth of Root Zone In Feet (5)	IRRIGATIONS No. Of (6)	IRRIGATIONS Total Depth in Inches (7)	IRRIGATIONS Average Inches Applied (8)	Difference Between Columns 4 and 8 (9)	Average Crop Yield Per Acre (10)
I	Alfalfa	36.0	3.2	4.0	45	187.0	4.2	1.0	3.7 t
	Berries	6.0	2.4	3.0	35	104.3	3.0	0.6	—
	Melons	8.0	2.4	3.0	20	55.3	2.8	0.4	—
	Orchard	154.0	2.4	4.0	210	560.6	2.7	0.3	—
	Peas	19.0	2.4	3.0	17	75.7	4.4	2.0	1.6 t
	Tomatoes	6.0	2.4	3.0	28	134.7	4.8	2.4	8 t
	Totals	229.0	2.5	3.3	355	1117.6	2.7	0.2	None
II	Alfalfa	15.0	5.0	5.0	15	31.9	2.1	-2.9	5 t
	Barley	1.0	5.2	4.0	1	1.0	1.0	-4.2	53 b
	Garden	3.0	3.0	3.0	10	14.3	1.4	-1.6	—
	Peas	11.0	3.0	3.0	19	64.7	3.4	0.4	1.6 t
	Potatoes	5.0	4.0	4.0	18	53.1	2.9	-1.1	160 b
	Sugar beets	25.5	4.0	4.0	33	83.9	2.5	-1.5	24.7 t
	Tomatoes	10.5	4.0	4.0	30	221.8	7.4	3.4	13.4 t
	Wheat	7.5	4.0	4.0	6	26.7	4.4	0.4	51.5 b
	Totals	78.5	4.0	3.9	132	497.4	3.8	-0.2	None

twice as much water as was necessary, while the peas on farm 1 were produced with half the amount of water which could be stored in the 3-foot depth of soil. A checkup to determine the reason for this difference shown in these records indicates that on farm 20 the soil carries a larger percentage of clay and is much less permeable than the soils on the higher areas, represented by farms 1 and 2. There was no doubt a considerable amount of water allowed to run off the fields of sugar beets and peas on farm 20.

There seems to be a wider variation in the irrigation of tomatoes than any other crop grown on the Roy area. The opinion of the farmers is about evenly divided as to the amount of water desirable for the irrigation of tomatoes; one opinion is that tomatoes should be irrigated rather lightly at all times, while the other is that tomatoes should receive an extra heavy application of water following the blooming stage in order to stunt vines and force fruiting. This is shown in the records in table 12. Tomatoes on farms 2 and 7 were irrigated excessively while tomatoes on farms 4, 20 and 26 were given light applications.

Records of early potatoes also show a wide variation in the amount of water used. The record on farm 7 shows that 26.4 inches of water were used during the season on potatoes, while on farm 26 only 11.4 inches were used. Table 13 shows the total applications and the amount of water applied to crops on Class I and Class II soils. The average application per irrigation was 3.6 on Class I soils and 3.8 on Class II soils. These figures indicate that on the whole farms shown in the tables for the Roy area seem to be quite carefully irrigated.

Hooper.

The town of Hooper is located in the southwest corner of the county close to the shores of Great Salt Lake. It is composed of 142 farms with

3817 acres of cropland and 267 acres of plowable pasture. Practically all of the farms of this area are larger than 10 acres in size and the entire water supply comes from the Weber River through the Hooper Irrigation Canal. There are 22 farms reported in this irrigation study of Hooper, all located on Class II soils. The soil is fine sandy loam varying in depth from 3 to 6 feet and is underlaid with quicksand at a depth varying from 3 to 6 feet. Alfalfa, beets, barley, peas, potatoes, tomatoes, and wheat are the chief crops produced in this community.

If we assume the average root depth for alfalfa in the Hooper area to be approximately 5 feet and the water storage capacity of the soil to be 1.0 to 1.1 inches per foot depth of soil, the irrigations of alfalfa over the entire area are very light, the average application being 2.3 inches. The largest seasonal use of water is shown on farm 86 table 14 with an application of 35 inches in 12 irrigations, while the smallest application is 1.9 inches in one irrigation on farm 83. The tonnage of alfalfa produced in the Hooper area ranges from 3½ to 5 tons per acre. No doubt the alfalfa on the farms reported in table 14 received considerable moisture from underground sources.

Irrigation records on the production of barley show a variation from 5 inches of water applied at one time to 7.2 inches applied in two irrigations. The smallest seasonal application was on farm 85 where 2.1 inches were applied in one irrigation. The water storage capacity of the farms growing barley is about 1.0 inch per foot depth of soil. A conclusion might be drawn from a study of barley crop that, with the exception of one farm, the use of water was very economical.

Sugar beet records show a similar careful use of water. The seasonal use ranges from 27 inches on farm 86 to 5.4 inches on farm 74 and the number of irrigations varies from 3 on farm 43 to 11 on farm 86. When

Table 14. Summary tabulation by crops of water applications, depth of root zone, and water storage capacity of soils in Hooper area

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS			Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
						No. Of (7)	Total Depth in Inches (8)	Average Inches Applied (9)		
19	II	Alfalfa	2.0	4.0	1.0	2	5.7	2.8	4.0	4 t
21	II		12.0	5.0	1.1	8	14.4	1.8	5.5	3.5 t
22	II		5.0	5.0	1.1	5	14.1	2.8	5.5	4 t
41	II		7.8	4.0	1.1	5	5.7	1.1	4.4	3½ t
58	II		16.0	5.0	1.1	5	7.1	1.4	5.5	4 t
79	II		10.0	5.0	1.1	10	24.8	2.5	5.5	3 t
83	II		6.0	5.0	1.1	1	1.9	1.9	5.5	4 t
84	II		6.5	5.0	1.0	2	3.8	1.9	5.0	3 t
85	II		4.0	6.0	1.0	5	14.1	2.8	6.0	4 t
86	II		9.0	5.0	1.1	12	35.0	2.9	5.5	5 t
		Totals	77.5	4.9	1.1	55	126.6	2.3	5.2	3.8 t
02	II	Barley	4.0	4.0	1.0	1	5.0	5.0	4.0	50 b
31	II		3.5	4.0	1.0	2	7.2	3.6	4.0	85 b
60	II		6.0	4.0	1.0	2	6.3	3.1	4.0	70 b
74	II		2.0	4.0	1.0	4	6.0	1.5	4.0	55 b
84	II		5.5	4.0	1.0	1	3.8	3.8	4.0	40 b
85	II		1.0	4.0	1.0	1	2.1	2.1	4.0	55 b
		Totals	22.0	4.0	1.0	11	30.4	2.8	4.0	59.2 b
02	II	Onions	1.0	3.0	1.0	6	15.2	2.5	3.0	8 t
		Totals	1.0	3.0	1.0	6	15.2	2.5	3.0	8 t
19	II	Oats	6.0	4.0	1.0	2	6.2	3.1	4.0	70 b
78	II		3.0	4.0	1.0	2	2.9	1.4	4.0	35 b
83	II		8.0	4.0	1.1	3	11.1	3.7	4.4	50 b
84	II		8.0	4.0	1.0	2	5.7	2.8	4.0	50 b
		Totals	25.0	4.0	1.0	9	25.9	2.9	4.1	51.2 b

Table 14. (Continued)

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS			Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
						No. Of (7)	Total Depth in Inches (8)	Average Inches Applied (9)		
05	II	Peas	5.0	3.0	1.1	5	13.8	2.8	3.3	2 t
31	II		6.0	3.0	1.1	4	14.0	3.5	3.3	1½ t
85	II		2.0	3.0	1.1	2	6.4	3.2	3.3	2 t
87	II		2.0	3.0	1.1	3	20.4	6.8	3.3	2 t
		Totals	15.0	3.0	1.1	14	54.6	3.9	3.3	1.9 t
15	II	Potatoes	0.5	4.0	1.1	4	20.2	5.0	4.4	140 b
21	II		1.0	4.0	1.1	6	32.4	5.4	4.4	---
60	II		2.0	4.0	1.0	4	10.9	2.7	4.0	130 b
74	II		1.0	4.0	1.0	6	23.0	3.8	4.0	125 b
79	II		2.0	4.0	1.1	5	7.6	1.5	4.4	---
83	II		4.0	4.0	1.1	3	3.6	1.2	4.4	90 b
84	II		3.0	4.0	1.0	2	6.4	3.2	4.0	100 b
86	II		3.0	4.0	1.1	9	18.4	2.0	4.4	200 b
87	II		2.5	4.0	1.1	3	12.5	4.2	4.4	---
		Totals	19.0	4.0	1.1	42	135.0	3.2	4.3	130.8 b
31	II	Pasture	1.5	2.0	1.1	2	2.8	1.4	2.2	None
		Totals	1.5	2.0	1.1	2	2.8	1.4	2.2	None

Table 14. (Continued)

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS			Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
						No. Of (7)	Total Depth in Inches (8)	Average Inches Applied (9)		
02	II	Sugar beets	4.0	4.0	1.0	6	15.5	2.6	4.0	18 t
03	II		6.0	4.0	1.1	8	20.5	2.6	4.4	22 t
15	II		5.0	4.0	1.1	4	13.9	3.5	4.4	17 t
19	II		8.0	4.0	1.0	4	10.3	2.6	4.0	12 t
41	II		6.5	4.0	1.1	8	18.0	2.2	4.4	---
43	II		5.0	4.0	1.1	3	8.0	2.7	4.4	14 t
60	II		6.0	4.0	1.1	5	16.9	3.4	4.4	22 t
74	II		4.0	4.0	1.0	5	5.4	1.1	4.0	12½ t
79	II		3.0	4.0	1.1	7	11.9	1.7	4.4	---
80	II		16.0	4.0	1.1	7	8.5	1.2	4.4	20 t
81	II		6.0	4.0	1.1	8	22.0	2.7	4.4	20 t
83	II		6.0	4.0	1.1	4	8.3	2.1	4.4	17 t
85	II		4.0	4.0	1.1	7	17.5	2.5	4.4	18 t
86	II		13.0	4.0	1.1	11	27.0	2.5	4.4	20 t
87	II		3.5	4.0	1.1	4	19.8	4.9	4.4	---
		Totals	96.0	4.0	1.1	91	223.5	2.5	4.3	17.7 t
15	II	Wheat	4.5	4.0	1.1	3	10.5	3.5	4.4	32 b
21	II		6.0	4.0	1.1	4	18.6	4.6	4.4	---
22	II		4.0	4.0	1.1	2	6.5	3.2	4.4	27 b
60	II		4.0	4.0	1.0	3	11.4	3.8	4.0	33 b
78	II		6.0	4.0	1.1	3	4.1	1.4	4.4	30 b
84	II		2.5	4.0	1.1	2	4.5	2.2	4.4	30 b
86	II		5.0	4.0	1.1	2	12.5	6.2	4.4	35 b
87	II		3.5	4.0	1.1	4	19.5	4.9	4.4	---
		Totals	35.5	4.0	1.1	23	87.6	3.8	4.3	31.2 b

Table 15. Relationship between water applied, soil storage capacity, and crop yields for the different soil classes in Hooper area

Soil Class (1)	Crop (2)	Acres (3)	Approx. Soil Storage Capacity (4)	Approx. Depth of Root Zone In Feet (5)	IRRIGATIONS No. Of (6)	IRRIGATIONS Total Depth in Inches (7)	IRRIGATIONS Average Inches Applied (8)	Difference Between Columns 4 and 8 (9)	Average Crop Yield Per Acre (10)
II	Alfalfa	77.5	5.2	4.9	55	126.6	2.3	-2.9	3.8 t
	Barley	22.0	4.0	4.0	11	30.4	2.8	-1.2	59.2 b
	Oats	25.0	4.1	4.0	9	25.9	2.9	-1.2	51.2 b
	Onions	1.0	3.0	3.0	6	15.2	2.5	-0.5	8 t
	Pasture	1.5	2.2	2.0	2	2.8	1.4	-0.8	None
	Peas	15.0	3.3	3.0	14	54.6	3.9	0.6	1.9 t
	Potatoes	19.0	4.3	4.0	42	135.0	3.2	-1.1	130.8 b
	Sugar beets	96.0	4.3	4.0	91	223.5	2.5	-1.8	17.7 t
	Wheat	35.5	4.3	4.0	23	87.6	3.8	-0.5	31.2 b
	Totals	292.5	4.0	3.7	253	701.6	2.8	-1.2	None

the average application per irrigation is considered, there is no over-irrigation of sugar beets indicated on the records on 15 farms in the Hooper Area.

Irrigation of potatoes also shows careful application of water. Farms 15 and 21 give records of irrigation on potatoes of approximately the same as the water storage capacity of the soil, while the other 7 farms show rather light irrigations. The average depth of water applied for irrigation on the potato crop is 3.2 inches. The same careful use of water indicated in the above discussion of the Hooper area also shows on the records compiled for other crops in table 15.

Taylor and Kanesville.

The Wilson Canal system serves the towns of Wilson, Taylor, and Kanesville with water from the Weber River. The records shown in table 16 are compiled on farms of Taylor and Kanesville. There are approximately 117 farms on these two communities, and the consus shows that the cropland consists of 3538 acres. The soil of this area is very similar to the Class II soils of Hooper and Roy. Underground water is near the surface of most of the Taylor and Kanesville area. Crops produced are the same as in the Hooper area.

A study of tables 16 and 17 indicates the same careful use of irrigation water in these two communities as is shown on the records of Roy and Hooper. Farm 2, table 16, shows an application of 5.3 inches of water per irrigation on alfalfa and an average of 5.6 inches on oats; these are the heaviest applications recorded. This farm is located on the banks of the Weber River on a soil which is somewhat more permeable and deeper than the soils on the other farms included in this study; and the fact that this farm is irrigated from a pumping plant may account for this excessive water application, although most irrigators apply less water when pumping is necessary.

Table 16. Summary tabulation by crops of water applications, depth of root zone, and water storage capacity of soils in Taylor area

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS			Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
						No. Of (7)	Total Depth in Inches (8)	Average Inches Applied (9)		
88	II	Alfalfa	11.0	4.0	1.1	6	11.1	1.8	4.4	3½ t
83	II		11.0	4.0	1.1	5	17.5	3.5	4.4	3½ t
86	II		2.2	4.0	1.1	12	38.0	3.2	4.4	2⅞ t
96	II		5.5	4.0	1.1	5	3.9	0.8	4.4	6½ t
02	II		60.0	5.0	1.1	4	21.4	5.3	5.5	3 t
43	II		3.5	5.0	1.0	11	23.8	2.2	5.0	4 t
19	II		4.0	5.0	1.1	2	3.3	1.6	5.5	3 t
43	II		4.0	4.0	1.1	4	13.0	3.2	4.4	3 t
93	II		3.0	4.0	1.1	5	17.9	3.6	4.4	4 t
		Totals	104.2	4.3	1.1	54	149.9	2.8	4.7	3.7 t
88	II	Barley	1.5	4.0	1.1	4	8.6	2.1	4.4	60 b
13	II		4.0	4.0	1.1	3	13.2	4.4	4.4	35 b
43	II		2.0	4.0	1.1	1	4.2	4.2	4.4	60 b
61	II		4.0	4.0	1.0	1	1.0	1.0	4.0	30 b
		Totals	11.5	4.0	1.1	9	27.0	3.0	4.3	46.2 b
19	II	Melons	1.0	3.0	1.0	7	11.9	1.7	3.0	4 t
		Totals	1.0	3.0	1.0	7	11.9	1.7	3.0	4 t
88	II	Oats	1.5	4.0	1.1	2	4.1	2.0	4.4	62 b
02	II		3.5	4.0	1.1	2	11.2	5.6	4.4	65 b
93	II		4.0	4.0	1.1	3	11.6	3.9	4.4	63 b
		Totals	9.0	4.0	1.1	7	26.9	3.8	4.4	63.3 b

Table 16. (Continued)

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS			Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
						No. Of (7)	Total Depth in Inches (8)	Average Inches Applied (9)		
88	II	Peas	1.0	3.0	1.1	3	4.9	1.6	3.3	1½ t
19	II		2.0	3.0	1.0	5	10.7	2.1	3.0	1 t
43	II		1.5	3.0	1.1	2	5.3	2.6	3.3	2 t
21	II		1.0	3.0	1.0	2	1.6	0.8	3.0	2 t
		Totals	5.5	3.0	1.0	12	22.5	1.9	3.1	1.6 t
88	II	Potatoes	5.0	4.0	1.1	11	14.5	1.3	4.4	189 b
83	II		2.0	4.0	1.1	7	14.1	2.0	4.4	125 b
96	II		4.0	4.0	1.1	8	8.6	1.1	4.4	207 b
43	II		1.5	4.0	1.1	9	16.3	1.8	4.4	260 b
19	II		1.0	4.0	1.1	6	12.7	2.1	4.4	60 b
43	II		2.0	4.0	1.1	3	5.7	1.9	4.4	150 b
21	II		5.0	4.0	1.1	3	7.5	2.5	4.4	200 b
61	II		5.0	4.0	1.1	3	5.6	1.9	4.4	100 b
		Totals	25.5	4.0	1.1	50	85.0	1.7	4.4	161.4 b
83	II	Beets, Sugar	2.0	4.0	1.1	5	17.5	3.5	4.4	16 t
86	II		2.0	4.0	1.1	9	54.0	6.0	4.4	15 t
96	II		5.0	4.0	1.1	4	4.3	1.1	4.4	22.75 t
43	II		1.5	4.0	1.0	8	20.9	2.6	4.0	12 t
43	II		5.5	4.0	1.0	7	19.4	2.8	4.0	16 t
93	II		6.5	4.0	1.0	6	14.0	2.3	4.0	21 t
21	II		4.7	4.0	1.0	2	3.6	1.8	4.0	27 t
		Totals	27.2	4.0	1.0	41	133.7	3.3	4.2	18.5 t

Table 16. (Continued)

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS			Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
						No. Of (7)	Total Depth in Inches (8)	Average Inches Applied (9)		
86	II	Tomatoes	1.0	3.0	1.1	6	16.9	2.8	3.3	10 t
93	II		2.0	3.0	1.0	8	15.0	1.9	3.0	12 t
		Totals	3.0	3.0	1.0	14	31.9	2.3	3.1	11 t
83	II	Wheat	6.0	4.0	1.1	4	13.3	3.3	4.4	28 b
96	II		3.0	4.0	1.1	4	2.8	0.7	4.4	47 b
13	II		6.0	4.0	1.1	4	16.8	4.2	4.4	27 b
02	II		10.5	4.0	1.0	2	10.6	5.3	4.0	30 b
43	II		3.0	4.0	1.0	2	5.3	2.6	4.0	30 b
21	II		1.5	4.0	1.0	2	2.7	1.3	4.0	10 b
61	II		5.0	4.0	1.0	3	4.4	1.5	4.0	6 b
		Totals	35.0	4.0	1.0	21	55.9	2.7	4.2	25.4 b

Table 17. Relationship between water applied, soil storage capacity, and crop yields for the different soil classes in Taylor-Kanesville area

Soil Class (1)	Crop (2)	Acres (3)	Approx. Soil Storage Capacity (4)	Approx. Depth of Root Zone In Feet (5)	IRRIGATIONS No. Of (6)	IRRIGATIONS Total Depth in Inches (7)	IRRIGATIONS Average Inches Applied (8)	Difference Between Columns 4 and 8 (9)	Average Crop Yield Per Acre (10)
II	Alfalfa	130.2	4.7	4.3	75	196.9	2.8	-1.9	3.7 t
	Barley	11.5	4.3	4.0	9	27.0	3.0	-1.3	46.2 b
	Melons	1.0	3.0	3.0	7	11.9	1.7	-1.3	4.0 t
	Oats	9.0	4.4	4.0	7	26.9	3.8	-0.6	63.3 b
	Peas	14.5	3.1	3.0	19	45.8	1.9	-1.3	1.6 t
	Potatoes	25.5	4.4	4.0	50	85.0	1.7	-2.7	161.4 b
	Sugar beets	57.2	4.2	4.0	65	179.6	3.3	-0.9	18.5 t
	Tomatoes	3.0	3.1	3.0	14	31.9	2.3	-0.8	11.0 t
	Wheat	35.0	4.2	4.0	21	55.9	2.7	-1.5	25.4 b
	Totals	276.9	3.9	3.7	267	660.9	2.5	-1.4	None

North Ogden.

North Ogden, a town of approximately 85 farms which are 10 acres or more in size, lies 6 miles north of Ogden City. Its irrigation water supply comes from the Ogden River through the North Ogden Canal system and the recently constructed Ogden-Brigham highline canal from the Pine View reservoir. There are also three small canyon streams. Total land irrigation in the North Ogden area is about 3155 acres.

Land located above the North Ogden canal is chiefly Class I soil and the irrigated land below this canal is Class II. The Class I soil has a surface soil composed of sandy loam carrying considerable gravel which is underlaid at varying depths with coarse sand and gravel. Class II soil is chiefly sandy clay loam over laying clay at 3 to 6 feet.

Crops produced on North Ogden Class I soils are fruit, tomatoes, and alfalfa. The North Ogden farmers who are cultivating Class I soils have become accustomed to the use of small streams of water over a long period of years. The careful application of water was the rule on this Class I soil previous to 1937 when the high line canal from the Pine View Reservoir was completed. It appears that some of the farmers made rather excessive applications of water from the new source during 1938. This is pointed out by the two alfalfa records shown on table 18. Farm 52 used a small stream of water and applied a total of 8.6 inches during the season in 10 applications, while farm 74 applied 66.4 inches during the season in 5 applications of water. The water storage capacity of the North Ogden Class I soils ranges from approximately 0.8 inch to 1.0 inch per foot depth of soil.

Orchards on 6 farms in North Ogden were irrigated during the season with a total application of water of 21.4 inches. The average number of

applications was 9 and the average amount applied per irrigation was 2.4 inches.

The 3.6 inches average irrigation on a 24-acre orchard on farm 66 exceeded the soil storage which is 2.4 inches for a 3-foot root zone. The other extreme in regards to the amount of water applied per irrigation is shown on farm 52 where the average application was 1.5 inches. In the case of farm 66 the orchard was irrigated 8 times while on farm 52 it was irrigated 15 times. The seasonal applications in the North Ogden area is almost 50 per cent less than the seasonal application on orchard land on the Class I soils of the Roy district.

Referring further to table 18 we find that sugar beets on Class I soils on farm 66 have a seasonal application of 88.4 inches with an average of 5.2 inches per application. The water holding capacity of the soil on this sugar beet land is approximately 3.0 inches. The water was applied 17 times during the season. This is another case of excessive use of water since more water became available in the North Ogden area.

Another record showing high application of irrigation water on Class I soil is in the case of farm 74 also in table 18, when it is shown that 3 irrigations with 10.6 inches average per irrigation is approximately 3 times the storage capacity of the soil.

Class II soils of the North Ogden area are irrigated from the North Ogden canal. On 4 farms on which irrigation records are available alfalfa was not over-irrigated. Farm 77 shows the seasonal use of 28.8 inches or an average application of 5.7 inches.

All of the crops listed in table 19 except fruit were irrigated beyond the water storage capacity of Class I soil, while on Class II soils peas, tomatoes and wheat were excessively irrigated.

Table 18. Summary tabulation by crops of water applications, depth of root zone, and water storage capacity of soils in North Ogden area

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS No. Of (7)	IRRIGATIONS Total Depth in Inches (8)	IRRIGATIONS Average Inches Applied (9)	Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
52	I	Alfalfa	4.0	3.0	0.8	10	8.6	0.9	2.4	--3 t
74	I		2.0	3.0	0.9	5	66.4	13.3	2.7	--3 t
36	II		11.0	3.0	1.0	5	7.2	1.4	3.0	4 t
40	II		15.0	5.0	1.1	6	24.8	4.1	5.5	3.5 t
77	II		5.0	5.0	1.1	5	28.8	5.8	5.5	4 t
83	II		4.0	3.0	1.0	2	6.0	3.9	3.0	4 t
		Totals	41.0	3.7	1.0	33	141.8	4.3	3.7	3.6 t
66	I	Barley	3.0	3.0	1.0	4	17.2	4.3	3.0	60 b
74	I		4.5	3.0	0.9	2	18.2	9.1	2.7	42 b
36	II		2.5	4.0	1.3	1	2.2	2.2	5.2	58 b
		Totals	10.0	3.3	1.1	7	37.6	5.4	3.6	53.3 b
52	I	Orchard	3.0	3.0	0.8	15	22.8	1.5	2.4	---
69	I		7.0	3.0	1.0	13	22.1	1.7	3.0	---
66	I		24.0	3.0	0.8	8	29.1	3.6	2.4	---
79	I		7.0	3.0	0.8	6	9.5	1.6	2.4	---
79	I		7.0	3.0	0.8	8	14.4	1.8	2.4	---
84	I		4.0	3.0	0.8	12	36.0	3.0	2.4	---
84	I		3.0	3.0	0.8	11	29.7	2.7	2.4	---
77	II		4.0	4.0	1.0	7	20.0	2.9	4.0	---
		Totals	59.0	3.1	0.8	80	183.6	2.3	2.7	---
66	I	Sugar beets	2.5	3.0	1.0	17	88.4	5.2	3.0	17.5 t
36	II		2.5	3.0	1.0	5	12.9	2.6	3.0	15 t
		Totals	5.0	3.0	1.0	22	101.3	4.6	3.0	16.2 t

Table 18. (Continued)

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS			Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
						No. Of (7)	Total Depth in Inches (8)	Average Inches Applied (9)		
10	I	Peas	5.0	3.0	1.0	5	15.5	3.1	3.0	1 t
74	I		3.0	3.0	0.9	3	31.5	10.5	2.7	1 t
36	II		4.0	3.0	1.0	2	4.7	2.3	3.0	2.4 t
40	II		2.0	3.0	1.0	3	26.6	8.9	3.0	1.2 t
51	II		2.0	3.0	1.0	2	8.8	4.4	3.0	2 t
83	II		3.5	3.0	1.0	4	15.9	4.0	3.0	1 t
		Totals	19.5	3.0	1.0	19	103.0	5.4	2.9	1.4 t
10	I	Tomatoes	7.0	3.0	1.0	9	19.9	2.2	3.0	7 t
66	I		2.5	3.0	1.0	18	73.2	4.1	3.0	18 t
84	I		1.0	3.0	0.8	11	44.0	4.0	2.4	6 t
74	I		1.5	3.0	0.9	5	62.4	12.5	2.7	7 t
83	II		1.5	3.0	1.0	8	51.1	6.4	3.0	7 t
		Totals	13.5	3.0	0.9	51	250.6	4.9	2.8	9 t
36	II	Wheat	2.0	4.0	1.0	1	1.6	1.6	4.0	35 b
40	II		4.0	4.0	1.1	1	9.1	9.0	4.4	45 b
60	II		7.2	4.0	1.1	1	6.0	6.0	4.4	58 b
		Totals	11.2	4.0	1.1	3	16.7	5.6	4.3	46 b

Table 19. Relationship between water applied, soil storage capacity, and crop yields for the different soil classes in North Ogden area

Soil Class (1)	Crop (2)	Acres (3)	Approx. Soil Storage Capacity (4)	Approx. Depth of Root Zone In Feet (5)	IRRIGATIONS			Difference Between Columns 4 and 8 (9)	Average Crop Yield Per Acre (10)
					No. Of (6)	Total Depth in Inches (7)	Average Inches Applied (8)		
I	Alfalfa	6.0	2.5	3.0	15	75.0	5.0	-2.5	3.0 t
	Barley	7.5	2.8	3.0	6	35.4	5.9	3.1	51.0 b
	Orchard	55.0	2.5	3.0	73	163.6	2.2	-0.3	---
	Peas	8.0	2.8	3.0	8	47.0	5.9	3.1	1.0 t
	Sugar beets	2.5	3.0	3.0	17	88.4	5.2	2.2	17.5 t
	Tomatoes	12.0	2.8	3.0	43	199.5	4.6	1.8	9.5 t
	Totals	91.0	2.7	3.0	162	608.9	3.8	1.1	None
II	Alfalfa	35.0	4.2	4.0	18	66.8	3.7	-0.5	3.9 t
	Barley	2.5	5.2	4.0	1	2.2	2.2	-3.0	58.0 b
	Orchard	4.0	4.0	4.0	7	20.0	2.9	-1.1	---
	Peas	11.5	3.0	3.0	11	56.0	5.1	2.1	1.7 t
	Sugar beets	2.5	3.0	3.0	5	12.9	2.6	-0.4	15.0 t
	Tomatoes	1.5	3.0	3.0	8	51.1	6.4	3.4	7.0 t
	Wheat	11.2	4.3	4.0	3	16.7	5.6	1.3	46.0 b
	Totals	68.2	3.8	3.6	53	225.7	4.3	0.5	None

Plain City.

Plain City, located on the north west corner of the county, is composed of 138 farms with a total of 3851 acres of crop land. Approximately 20 per cent of the farms of this area are less than 10 acres in extent. The Plain City canal has its head gates near the junction of the Ogden and Weber Rivers, and can draw water from either source. Early water is drawn from the Ogden River and late water from the Echo Reservoir on the Weber River. Soils of farms on which irrigation records are available are Class II fine sandy loam. This soil, ranging from 3 to 5 feet in depth, is underlaid with water bearing quicksand. There is no doubt considerable capillary movement of water from this underground watertable upwards toward the surface. Irrigation records on alfalfa in Table 20 show rather light applications. Farm 55 has somewhat heavier type of soil than the majority of the Plain City area. The water storage capacity of this soil is estimated to be 1.2 inches per foot depth of soil. The alfalfa on this farm was irrigated 7 times with a total application of 29.3 inches and an average of 4.2 per irrigation. The other three records show very light irrigations.

Sugar beets on the three farms on which records are available indicate a seasonal application of 28 inches and 6 irrigations with an average of 4.4 inches per application. There are not enough farms included in the Plain City area and they are not located in such a manner that a general statement of facts indicated by these records could be applied to the whole district.

Pleasant View.

Pleasant View is located along the foot hills of Mount Ben Lomond just south of the Utah Hot Springs on the State Highway. It is composed of 59 farms with 1685 acres of crop land. The soil is Class II, a dark

Table 20. Summary tabulation by crops of water applications, depth of root zone, and water storage capacity of soils in Plain City area

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS			Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
						No. Of (7)	Total Depth in Inches (8)	Average Inches Applied (9)		
55	II	Alfalfa	7.0	5.0	1.2	7	29.3	4.2	6.0	4.5 t
83	II		7.0	5.0	1.0	3	5.7	1.9	5.0	5.0 t
96	II		7.0	5.0	1.0	7	10.5	1.5	5.0	4.0 t
44	II		7.0	5.0	1.0	8	21.8	2.7	5.0	4.0 t
		Totals	28.0	5.0	1.0	25	67.3	2.7	5.2	4.4 t
55	II	Barley	6.0	4.0	1.2	2	10.6	5.3	4.8	87.0 b
		Totals	6.0	4.0	1.2	2	10.6	5.3	4.8	87.0 b
83	II	Onions	1.0	3.0	1.1	5	20.0	4.0	3.3	400 b
		Totals	1.0	3.0	1.1	5	20.0	4.0	3.3	400 b
83	II	Potatoes	3.0	4.0	1.0	4	10.5	2.6	4.0	220 b
93	II		2.5	4.0	1.0	6	10.2	1.7	4.0	160 b
47	II		12.5	4.0	1.2	6	27.2	4.5	4.8	250 b
		Totals	18.0	4.0	1.1	16	47.9	3.0	4.3	213 b
44	II	Sugar beets	2.8	4.0	1.1	6	32.7	4.4	4.4	18.0 t
47	II		9.0	4.0	1.2	6	26.7	4.4	4.8	28.0 t
47	II		13.0	4.0	1.2	7	27.2	4.5	4.8	28.0 t
		Totals	24.8	4.0	1.2	19	86.6	4.6	4.7	24.6 t

Table 21. Relationship between water applied, soil storage capacity, and crop yields for the different soil classes in Plain City area

Soil Class (1)	Crop (2)	Acres (3)	Approx. Soil Storage Capacity (4)	Approx. Depth of Root Zone In Feet (5)	IRRIGATIONS No. Of (6)	IRRIGATIONS Total Depth in Inches (7)	IRRIGATIONS Average Inches Applied (8)	Difference Between Columns 4 and 8 (9)	Average Crop Yield Per Acre (10)
II	Alfalfa	28.0	5.2	5.0	25	67.3	2.7	-2.5	4.4 t
	Barley	6.0	4.8	4.0	2	10.6	5.3	0.5	87.0 b
	Onions	1.0	3.3	3.0	5	20.0	4.0	0.7	400 b
	Potatoes	18.0	4.3	4.0	16	47.9	3.0	-1.3	235 b
	Sugar beets	24.8	4.7	4.0	19	86.6	4.6	-0.2	28.0 t
	Totals	77.8	4.5	4.0	67	232.4	3.5	-1.0	None

fine sandy clay loam of uniform texture about 3 to 6 feet deep, well drained except the lowland contact area where a layer of clay comes close to the surface. The chief crops produced in Pleasant View are alfalfa, fruit, and peas.

This area is irrigated by the North Ogden Canal, Brigham-Ogden Canal, and two small streams known as Alder Creek and Little Missouri. Most of the land cropped to fruit lies on the steep side hills above the North Ogden Canal. Very small streams are used to avoid soil erosion.

Alfalfa is produced on the area bordering the North Ogden Canal. Table 22 shows a conservative use of water except in the case of farm 73 where only one application of 7.2 inches was applied. Farm 10 used 40.4 inches during the season with an average application of 5.5 inches of water. Farm 16 has a very steep gradient and the alfalfa was irrigated often. The records show 15 applications to apply 7.2 inches of water during the season.

Orchards of Pleasant View are given an average of 8.3 applications of 1.7 inches of water during the summer, as recorded on table 23, which is a seasonal average of 14.3 inches. The water storage capacity of the soil is approximately 4.4 inches for the 4 foot root zone.

Peas grown on the land below the North Ogden Canal were irrigated with an average application of 3.6 inches of water compared with an average soil storage capacity of 3.9 inches.

Marriott.

The Marriott area includes west 12th Street of Ogden City and 3 miles westward, and has a total of 47 farms, consisting of about 893 acres of cropland and 3.9 acres of plowable pasture. Seventeen farms of the Marriott area are less than 10 acres in size.

Table 22. Summary tabulation by crops of water applications, depth of root zone, and water storage capacity of soils in Pleasant View area

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS			Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
						No. Of (7)	Total Depth in Inches (8)	Average Inches Applied (9)		
10	II	Alfalfa	5.0	6.0	1.1	8	40.4	5.0	6.6	3.5 t
17	II		10.0	4.0	1.1	6	20.1	3.3	4.4	3.5 t
18	II		2.0	4.0	1.0	15	7.5	0.5	4.0	2.0 t
19	II		4.0	5.0-	1.1	3	9.3	3.1	5.5	4.0 t
73	II		1.0	5.0	1.1	1	7.2	7.2	5.5	4.0 t
83	II		4.0	5.0	1.1	5	11.0	2.2	5.5	4.0 t
		Totals	26.0	4.8	1.1	38	95.5	2.5	5.2	3.5 t
17	II	Oats	4.0	4.0	1.1	1	3.2	3.2	4.4	62 b
19	II		3.0	4.0	1.1	1	3.4	3.4	4.4	65 b
83	II		3.0	4.0	1.1	1	2.0	2.0	4.4	75 b
		Totals	10.0	4.0	1.1	3	8.6	2.9	4.4	67 b
10	II	Orchard	2.0	4.0	1.0	5	14.1	2.8	4.0	---
17	II		6.0	4.0	1.0	10	16.0	1.6	4.0	---
18	II		3.0	4.0	1.1	15	7.5	0.5	4.4	---
19	II		1.5	4.0	1.1	4	15.2	3.8	4.4	---
73	II		3.0	4.0	1.1	6	12.8	2.1	4.4	---
83	II		2.0	4.0	1.1	9	19.9	2.2	4.4	---
83	II		10.0	4.0	1.1	9	14.3	1.6	4.4	---
		Totals	27.5	4.0	1.1	58	99.8	1.7	4.3	---
17	II	Peas	2.0	3.0	1.0	1	1.3	1.3	3.0	1.3 t
19	II		2.0	3.0	1.1	2	11.0	5.5	3.3	2.0 t
73	II		1.0	3.0	1.1	3	12.4	4.1	3.3	1.5 t
83	II		3.0	3.0	1.1	3	7.3	2.4	3.3	2.0 t
		Totals	8.0	3.0	1.1	9	32.0	3.6	3.2	1.7 t

Table 23. Relationship between water applied, soil storage capacity, and crop yields for the different soil classes in Pleasant View area

Soil Class (1)	Crop (2)	Acres (3)	Approx. Soil Storage Capacity (4)	Approx. Depth of Root Zone In Feet (5)	IRRIGATIONS			Difference Between Columns 4 and 8 (9)	Average Crop Yield Per Acre (10)
					No. Of (6)	Total Depth in Inches (7)	Average Inches Applied (8)		
II	Alfalfa	26.0	5.2	4.8	38	95.5	2.5	-2.7	3.5 t
	Oats	10.0	4.4	4.0	2	5.4	2.7	-1.7	67.0 b
	Orchard	27.5	4.3	4.0	58	99.8	1.7	-2.6	---
	Peas	8.0	3.2	3.0	9	32.0	3.6	0.4	1.7 t
	Tomatoes	6.0	4.4	4.0	10	45.9	4.5	0.1	7.0 t
	Totals	77.5	4.3	4.0	117	277.7	2.4	-1.9	None

Table 24. Summary tabulation by crops of water applications, depth of root zone, and water storage capacity of soils in Marriott area

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS			Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
						No. Of (7)	Total Depth in Inches (8)	Average Inches Applied (9)		
61	II	Barley	8.0	4.0	1.1	2	4.9	2.4	4.4	82 b
		Totals	8.0	4.0	1.1	2	4.9	2.4	4.4	82 b
80	II	Beans	7.0	3.0	1.1	6	2.2	0.4	3.3	---
		Totals	7.0	3.0	1.1	6	2.2	0.4	3.3	---
56	II	Pasture	12.0	3.0	1.0	9	10.2	1.1	3.0	---
		Totals	12.0	3.0	1.0	9	10.2	1.1	3.0	---
55	II	Potatoes	6.5	4.0	1.1	4	12.0	3.0	4.4	110 b
		Totals	6.5	4.0	1.1	4	12.0	3.0	4.4	110 b
55	II	Sugar beets	2.5	4.0	1.1	6	27.5	4.6	4.4	21 t
56	II		10.0	4.0	1.1	4	14.0	3.5	4.4	22 t
61	II		9.0	4.0	1.1	9	22.4	2.5	4.4	19 t
76	II		15.0	4.0	1.1	11	36.6	3.3	4.4	17 t
		Totals	36.5	4.0	1.1	30	100.5	3.3	4.4	19.7 t
55	II	Wheat	2.0	4.0	1.1	3	15.2	5.1	4.4	47 b
		Totals	2.0	4.0	1.1	3	15.2	5.1	4.4	47 b

Table 25. Relationship between water applied, soil storage capacity, and crop yields for the different soil classes in Marriott area

Soil Class (1)	Crop (2)	Acres (3)	Approx. Soil Storage Capacity (4)	Approx. Depth of Root Zone In Feet (5)	IRRIGATIONS			Difference Between Columns 4 and 8 (9)	Average Crop Yield Per Acre (10)
					No. Of (6)	Total Depth in Inches (7)	Average Inches Applied (8)		
II	Barley	8.0	4.4	4.0	2	4.9	2.4	-1.9	82.0 b
	Beans	7.0	3.3	3.0	6	2.2	0.4	-3.1	---
	Pasture	12.0	3.0	3.0	9	10.2	1.1	-1.9	---
	Potatoes	6.5	4.4	4.0	4	12.0	3.0	-1.4	110 b
	Sugar beets	36.5	4.4	4.0	30	100.5	3.3	-1.1	19.7 t
	Wheat	2.0	4.4	4.0	3	15.2	5.1	0.7	47.0 b
	Totals	72.0	4.0	3.7	54	145.0	2.7	-1.3	None

The soil of this community is a uniform Class II sandy clay loam to a depth of 2 to 5 feet underlaid by clay, which is several feet in thickness. Irrigation water for Marriott comes from the Ogden River through Mill Creek which is a natural drain with its head at the control gates of the Pioneer Power plant waste canal, and the Marriott Canal, Bertonati Ditch, and Mound Fort Ditches Nos. 5 and 6. Crops produced are alfalfa, beets, early potatoes, and truck crops.

Records show that irrigation is carefully done. The average applications are all less than the water storage capacity of the soil. Table 25 shows that about 50 per cent as much water used as the soil storage capacity.

Warren.

The town of Warren is located in the extreme north west portion of Weber County and is composed of 58 farms having an area of about 1700 acres of crop land. The Class II soil is of fine sandy loam texture, is quite uniform in depth to 3 or more feet, and usually overlays water bearing quicksand. Over parts of the Warren area a shallow layer of clay separates the productive soil and the quicksand.

The Warren Canal supplies water from the Weber River to Warren and also to West Warren. The out take of the canal is located just north of the Sugar Factory on the Weber River and branches some 7 miles below, the north branch serving the town of Warren and the south branch directs water to West Warren.

Alfalfa, sugar beets, and early potatoes are the chief crops, while tomatoes and grain are also produced on a less extensive acreage.

All of the farms on which irrigation records are available are located on Class II soil. Comparisons of water applied per average irrigation with the water storage capacity of the soil shows a very economical

Table 26. Summary tabulation by crops of water applications, depth of root zone, and water storage capacity of soils in Warren-West Warren area

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS			Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
						No. Of (7)	Total Depth in Inches (8)	Average Inches Applied (9)		
10	II	Alfalfa	2.2	6.0	1.1	8	20.7	2.6	6.6	8.0 t
15	II		6.0	5.0	1.0	5	14.7	2.9	5.0	3.5 t
80	II		15.0	4.0	1.0	12	22.1	1.8	4.0	3.5 t
78	II		4.0	5.0	1.0	6	26.7	4.4	5.0	5.0 t
53	II		6.0	5.0	1.0	5	14.4	2.9	5.0	4.0 t
		Totals	33.2	5.0	1.0	36	98.6	2.7	5.0	4.8 t
09	II	Barley	6.5	4.0	1.0	1	1.8	1.8	4.0	60 b
		Totals	6.5	4.0	1.0	1	1.8	1.8	4.0	60 b
09	II	Onions	2.2	3.0	1.4	8	21.6	2.5	3.3	400 b
		Totals	2.2	3.0	1.4	8	21.6	2.5	3.3	400 b
10	II	Sugar beets	1.0	4.0	1.1	4	17.4	4.3	4.4	20.0 t
11	II		8.0	4.0	1.1	5	14.0	2.5	4.4	25.0 t
13	II		6.0	4.0	1.0	6	15.0	2.5	4.0	25.0 t
25	II		3.0	4.0	1.0	8	20.4	2.5	4.0	28.0 t
70	II		10.0	4.0	1.0	7	22.0	3.3	4.0	25.0 t
17	II		2.0	4.0	1.0	6	20.1	3.3	4.0	23.0 t
78	II		6.5	4.0	1.0	10	32.5	3.2	4.0	21.0 t
80	II		11.0	4.0	1.0	13	22.2	1.7	4.0	17.0 t
81	II		7.0	4.0	1.0	4	9.1	2.3	4.0	22.0 t
53	II		4.0	4.0	1.0	6	25.2	4.2	4.0	20.0 t
		Totals	58.5	4.0	1.0	69	197.9	2.9	4.1	22.9 t

Table 26. (Continued)

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS			Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
						No. Of (7)	Total Depth in Inches (8)	Average Inches Applied (9)		
11	II	Tomatoes	1.0	4.0	1.1	3	7.7	2.5	4.4	15 t
25	II		1.5	4.0	1.0	7	10.7	1.5	4.0	21 t
		Totals	2.5	4.0	1.0	10	18.4	1.8	4.2	18 t
81	II	Wheat	3.0	4.0	1.0	1	4.7	4.7	4.0	40 b
79	II		2.0	4.0	1.0	2	3.8	1.9	4.0	45 b
		Totals	5.0	4.0	1.0	3	8.5	2.8	4.0	42.5 b

Table 27. Relationship between water applied, soil storage capacity, and crop yields for the different soil classes in Warren-West Warren area

Soil Class (1)	Crop (2)	Acres (3)	Approx. Soil Storage Capacity (4)	Approx. Depth of Root Zone In Feet (5)	IRRIGATIONS			Difference Between Columns 4 and 8 (9)	Average Crop Yield Per Acre (10)
					No. Of (6)	Total Depth in Inches (7)	Average Inches Applied (8)		
II	Alfalfa	33.2	5.1	5.0	36	98.6	2.7	-2.4	4.8 t
	Barley	6.5	4.0	4.0	1	1.8	1.8	-2.2	60.0 b
	Onions	2.2	3.3	3.0	8	21.6	2.7	-0.9	400 cwt
	Sugar beets	58.5	4.1	4.0	69	197.9	2.9	-1.2	22.9 t
	Tomatoes	2.5	4.2	4.0	10	18.4	1.8	-2.4	18.0 t
	Wheat	5.0	4.0	4.0	3	8.5	2.8	-1.2	42.5 b
	Totals	107.9	4.1	4.0	127	346.8	2.7	-1.4	None

use of water, probably due chiefly to the underground water supply. This is shown on table 27. The average seasonal use of water on alfalfa is 19.7 inches; on sugar beets, 20.0; on the tomatoes, about 10.0; onions, 21.6; and wheat, 85.

Slaterville.

The Slaterville area is located about 2 miles north and west of the Ogden City boundary line and is composed of 73 farms with a total of 2230 acres of crop land. Soils of the area are chiefly Class II and are uniform fine sandy clay loam to a depth of 18 inches underlaid with about 6 to 12 inches of clay below which is water bearing silt to an undetermined depth.

Irrigation water is distributed to this community through South Slaterville Canal which irrigates about 428 acres, North Slaterville Canal irrigating 517 acres, and several smaller ditches taken out of Mill Creek. The South Slaterville Canal receives water from the Weber River and through Mill Creek from the Ogden River. Several small creeks fed by drainage from lands higher in the valley also contribute to the irrigation water supply of Slaterville.

Alfalfa on the farms with irrigation records is forced to root shallowly due to hard pan and underground water table. Irrigation water applied in the area is excessive when compared to the total storage capacity of such a shallow soil. The alfalfa records on farm 12, table 28 show an average application of 7.2 inches for each of 3 applications, and farm 63 used about the same number of inches during the season but applied the water 8 times. Both are excessive on such soils. In general it may be stated the records show over irrigation to be quite general in the Slaterville area. Yields of hay are exceptionally high, two farms reporting 5 tons per acre and two showing 6 tons per acre.

Table 28. Summary tabulation by crops of water applications, depth of root zone, and water storage capacity of soils in Slaterville area

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS			Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
						No. Of (7)	Total Depth in Inches (8)	Average Inches Applied (9)		
02	II	Alfalfa	10.0	2.0	1.1	3	10.6	3.5	2.2	5.0 t
02	II		8.0	2.0	1.1	3	9.2	3.1	2.2	5.0 t
12	II		2.5	3.0	1.1	3	21.6	7.2	3.3	5.0 t
46	II		6.0	2.0	1.1	4	7.3	1.8	2.2	6.0 t
63	II		5.5	3.0	1.1	8	32.9	4.1	3.3	6.0 t
		Totals	32.0	2.4	1.1	21	81.6	3.9	2.6	5.4 t
06	II	Barley	3.0	3.0	1.1	2	11.6	5.8	3.3	50 b
06	II		5.0	3.0	1.1	4	23.1	5.8	3.3	50 b
		Totals	8.0	3.0	1.1	6	34.8	5.8	3.3	50 b
02	II	Peas	2.5	2.0	1.1	3	15.2	5.1	2.2	1.5 t
06	II		6.0	3.0	1.1	2	11.2	5.6	3.3	1.7 t
		Totals	8.5	2.5	1.1	5	26.7	5.3	2.7	1.6 t
92	II	Potatoes	5.0	4.0	1.3	8	20.3	2.4	5.2	150 b
		Totals	5.0	4.0	1.3	8	20.3	2.4	5.2	150 b
12	II	Sugar beets	11.0	3.0	1.1	5	20.2	4.0	3.3	17.0 t
46	II		1.3	2.0	1.1	5	21.3	4.3	2.2	15.0 t
92	II		5.0	3.0	1.1	9	23.0	2.6	3.3	17.5 t
		Totals	17.3	2.7	1.1	19	64.5	3.4	2.9	16.0 t
02	II	Wheat	4.0	2.0	1.1	2	8.2	4.1	2.2	32.0 b
02	II		5.0	2.0	1.1	2	5.9	2.9	2.2	32.0 b
12	II		1.0	3.0	1.1	1	5.9	5.9	3.3	30.0 b
		Totals	10.0	7.0	1.1	5	20.0	4.3	2.6	31.3 b

Table 29. Relationship between water applied, soil storage capacity, and crop yields for the different soil classes in Slaterville area

Soil Class (1)	Crop (2)	Acres (3)	Approx. Soil Storage Capacity (4)	Approx. Depth of Root Zone In Feet (5)	IRRIGATIONS			Difference Between Columns 4 and 8 (9)	Average Crop Yield Per Acre (10)
					No. Of (6)	Total Depth in Inches (7)	Average Inches Applied (8)		
II	Alfalfa	32.0	2.6	2.4	21	81.6	3.9	1.0	5.4 t
	Barley	8.0	3.3	3.0	6	34.8	5.8	2.5	50.0 b
	Peas	8.5	2.7	2.5	5	26.7	5.3	2.6	1.6 t
	Potatoes	5.0	5.2	4.0	8	20.3	2.5	-2.8	150 b
	Sugar beets	17.3	2.9	2.7	19	64.5	3.4	0.7	16.0 t
	Wheat	15.0	2.7	2.5	7	26.9	3.8	1.1	29.5 b
	Totals	85.8	3.2	2.8	66	254.8	3.9	0.6	None

Table 30. Summary tabulation by crops of water applications, depth of root zone, and water storage capacity of soils in Harrisville area

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS			Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
						No. Of (7)	Total Depth in Inches (8)	Average Inches Applied (9)		
47	II	Alfalfa	6.0	5.0	1.0	3	7.3	2.4	5.0	4.0 t
50	II		5.0	5.0	1.0	10	24.0	2.4	5.0	3.0 t
67	II		4.0	5.0	1.0	9	10.8	1.2	5.0	4.0 t
82	II		5.5	4.0	1.0	6	23.3	3.9	4.0	6.0 t
83	II		4.0	5.0	1.0	7	16.6	2.4	5.0	5.0 t
84	II		2.5	5.0	1.0	5	11.9	2.4	5.0	5.0 t
86	II		25.0	5.0	1.0	4	16.1	4.0	5.0	2.5 t
87	II		3.0	5.0	1.0	5	16.8	3.4	5.0	5.0 t
87	II		1.0	5.0	1.0	4	12.6	3.1	5.0	5.0 t
92	II		4.0	6.0	1.0	4	14.4	3.6	5.0	2.5 t
98	II		8.0	5.0	1.0	2	2.8	1.4	5.0	4.0 t
		Totals	68.0	4.9	1.0	59	156.6	2.7	4.9	4.2 t
67	II	Pasture	10.0	3.0	1.0	12	13.8	1.1	3.0	---
84	II		2.0	3.0	1.0	5	10.8	2.2	3.0	---
85	II		10.0	3.0	1.0	10	16.6	1.7	3.0	---
		Totals	22.0	3.0	1.0	27	41.2	1.5	3.0	---
83	II	Peas	3.0	3.0	1.0	3	9.5	3.2	3.0	2.0 t
86	II		4.0	3.0	1.0	3	11.8	3.9	3.0	1.8 t
		Totals	7.0	3.0	1.0	6	21.3	3.5	3.0	1.9 t

Table 30. (Continued)

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS			Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
						No. Of (7)	Total Depth in Inches (8)	Average Inches Applied (9)		
47	II	Sugar beets	6.0	4.0	1.0	8	29.4	3.7	4.0	10.0 t
50	II		3.0	4.0	1.0	6	19.7	3.3	4.0	18.0 t
50	II		4.0	4.0	1.0	6	18.2	3.0	4.0	18.0 t
67	II		2.0	4.0	1.0	8	15.3	1.9	4.0	18.5 t
82	II		2.5	4.0	1.0	6	21.5	3.6	4.0	20.0 t
83	II		12.0	4.0	1.0	7	8.9	1.3	4.0	19.5 t
84	II		2.5	4.0	1.0	7	17.7	2.5	4.0	20.0 t
85	II		11.0	4.0	1.0	6	17.8	3.0	4.0	21.5 t
86	II		10.0	4.0	1.0	6	20.1	3.3	4.0	21.0 t
87	II		3.0	4.0	1.0	6	19.4	3.2	4.0	10.0 t
98	II		5.0	4.0	1.0	4	19.8	4.9	4.0	16.8 t
99	II		3.5	4.0	1.0	7	17.2	2.5	4.0	18.5 t
		Totals	64.5	4.0	1.0	77	225.0	2.9	4.0	17.6 t
82	II	Wheat	8.0	4.0	1.0	3	10.0	3.3	4.0	35.0 b
83	II		3.0	4.0	1.0	1	3.3	3.3	4.0	50.0 b
85	II		12.0	4.0	1.0	2	7.1	3.5	4.0	33.0 b
86	II		13.0	4.0	1.0	1	7.2	7.2	4.0	35.0 b
86	II		10.0	4.0	1.0	1	4.5	4.5	4.0	35.0 b
87	II		3.0	4.0	1.0	3	13.2	4.4	4.0	20.0 b
		Totals	49.0	4.0	1.0	11	45.3	4.1	4.0	34.6 b

Table 31. Relationship between water applied, soil storage capacity, and crop yields for the different soil classes in Harrisville area

Soil Class (1)	Crop (2)	Acres (3)	Approx. Soil Storage Capacity (4)	Approx. Depth of Root Zone In Feet (5)	IRRIGATIONS			Difference Between Columns 4 and 8 (9)	Average Crop Yield Per Acre (10)
					No. Of (6)	Total Depth in Inches (7)	Average Inches Applied (8)		
II	Alfalfa	68.0	4.9	4.9	59	156.6	2.7	-2.2	4.2 t
	Pasture	22.0	3.0	3.0	27	41.2	1.5	-1.5	9--
	Peas	7.0	3.0	3.0	6	21.3	3.5	0.5	1.9 t
	Sugar beets	64.5	4.0	4.0	77	225.0	2.9	-1.1	17.6 t
	Wheat	49.0	4.0	4.0	11	45.3	4.1	0.1	34.6 b
	Totals	210.5	3.8	3.8	180	489.4	2.7	-1.1	None

Table 32. Summary tabulation by crops of water applications, depth of root zone, and water storage capacity of soils in Farr West area

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS No. Of (7)	IRRIGATIONS Total Depth in Inches (8)	IRRIGATIONS Average Inches Applied (9)	Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
37	II	Alfalfa	19.0	3.0	1.0	6	14.2	2.4	3.0	4.0 t
38	II		8.0	5.0	1.1	9	25.9	2.9	5.5	6.0 t
41	II		35.0	5.0	1.1	5	13.2	2.6	5.5	5.0 t
43	II		14.0	6.0	1.1	6	31.3	5.2	6.6	3.5 t
43	II		25.0	6.0	1.1	4	15.6	3.9	6.6	4.0 t
44	II		2.0	4.0	1.1	4	15.1	3.8	4.4	4.0 t
45	II		16.0	5.0	1.0	5	24.4	4.9	5.0	5.0 t
46	II		4.0	4.0	1.1	5	19.6	3.9	4.4	6.0 t
48	II		2.0	4.0	1.1	5	14.3	2.9	4.4	5.5 t
50	II		14.0	5.0	1.1	13	15.3	1.2	5.5	3.0 t
53	II		13.0	5.0	1.1	4	28.4	7.1	5.5	3.0 t
58	II		12.0	5.0	1.1	7	14.7	2.1	5.5	4.0 t
66	II		4.0	5.0	1.1	5	23.6	4.7	5.5	2.0 t
66	II		5.0	5.0	1.1	5	17.2	3.4	5.5	2.5 t
72	II		5.0	5.0	1.1	10	32.6	3.3	5.5	4.0 t
76	II		12.0	4.0	1.1	6	15.3	2.5	4.4	3.5 t
78	II		6.0	4.0	1.1	6	18.9	3.1	4.4	4.0 t
87	II		6.0	5.0	1.1	7	18.2	2.6	5.5	5.5 t
95	II		8.5	4.0	1.1	6	16.1	2.7	4.4	3.3 t
		Totals	210.5	4.7	1.1	118	373.9	3.2	5.1	4.1 t
37	II	Peas	2.0	3.0	1.1	2	6.0	3.0	3.3	2.2 t
46	II		1.0	3.0	1.1	2	6.8	3.4	3.3	2.0 t
72	II		3.0	3.0	1.1	3	11.6	3.9	3.3	1.5 t
78	II		3.0	3.0	1.1	2	6.8	3.4	3.3	2.0 t
		Totals	9.0	3.0	1.1	9	31.2	3.5	3.3	1.9 t

Table 32. (Continued)

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS			Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
						No. Of (7)	Total Depth in Inches (8)	Average Inches Applied (9)		
43	II	Potatoes	2.0	4.0	1.1	11	66.8	6.9	4.4	213 b
45	II		2.5	4.0	1.1	7	30.7	4.4	4.4	180 b
48	II		3.3	4.0	1.1	10	29.8	3.0	4.4	200 b
72	II		1.0	4.0	1.1	3	11.3	5.6	4.4	150 b
		Totals	8.8	4.0	1.1	31	136.6	4.4	4.4	185.7 b
37	II	Sugar beets	7.0	4.0	1.1	6	14.1	2.3	4.4	21.5 t
43	II		10.8	4.0	1.1	10	64.0	6.4	4.4	22.3 t
45	II		4.5	4.0	1.1	9	44.1	4.9	4.4	24.0 t
46	II		3.0	4.0	1.1	7	19.6	2.8	4.4	25.0 t
48	II		6.5	4.0	1.1	6	21.5	3.6	4.4	21.0 t
50	II		7.0	4.0	1.1	14	26.6	1.9	4.4	23.0 t
66	II		4.0	4.0	111	6	35.7	5.9	4.4	17.0 t
72	II		5.0	4.0	1.1	8	24.3	3.0	4.4	24.0 t
76	II		3.0	4.0	1.1	10	28.3	2.8	4.4	12.0 t
78	II		13.0	4.0	1.1	6	20.4	3.4	4.4	25.0 t
87	II		12.0	4.0	1.1	12	29.2	2.4	4.4	20.0 t
95	II		3.5	4.0	1.1	4	14.7	3.7	4.4	25.0 t
		Totals	79.3	4.0	1.1	98	342.5	3.5	4.4	21.6 t
37	II	Wheat	3.0	4.0	1.1	1	1.9	1.9	4.4	30.0 b
45	II		3.0	4.0	1.1	3	8.6	2.9	4.4	31.0 b
44	II		2.5	4.0	1.1	2	10.9	5.4	4.4	58.0 b
46	II		1.0	4.0	1.1	3	15.0	5.0	4.4	85.0 b
72	II		4.0	4.0	1.1	2	7.5	3.7	4.4	40.0 b
76	II		1.0	4.0	1.1	2	11.3	5.6	4.4	55.0 b
6		Totals	14.5	4.0	1.1	13	55.3	4.3	4.4	41.5 b

Table 33. Relationship between water applied, soil storage capacity, and crop yields for the different soil classes in Farr West area

Soil Class (1)	Crop (2)	Acres (3)	Approx. Soil Storage Capacity (4)	Approx. Depth of Root Zone In Feet (5)	IRRIGATIONS No. Of (6)	IRRIGATIONS Total Depth in Inches (7)	IRRIGATIONS Average Inches Applied (8)	Difference Between Columns 4 and 8 (9)	Average Crop Yield Per Acre (10)
II	Alfalfa	210.5	5.1	4.7	118	373.9	3.2	-1.9	4.1 t
	Peas	9.0	3.3	3.0	9	31.2	3.5	0.2	1.9 t
	Potatoes	8.8	4.4	4.0	31	136.6	4.4	0.0	185.7 b
	Sugar beets	79.3	4.0	4.0	98	342.5	3.5	-0.9	21.6 t
	Wheat	14.5	4.4	4.0	13	55.2	4.3	-0.1	41.5 b
	Totals	322.1	4.3	3.9	269	939.4	3.5	-0.8	None

Wheat yields are exceptionally light due to an attack of rust. Wheat was affected to a considerable extent over the entire county in 1938 and shows in the tables of this thesis.

Harrisville and Farr West.

To the north and west of Ogden along the Plain City highway is an area irrigated by the Western Canal. It consists of Harrisville with 51 farms made up of 997 acres of cropland and 294 acres of plowable pasture, and Farr West district with 2111 acres of cropland and 1129 acres of pasture of a plowable nature. Approximately 25 of these 104 farms are less than 10 acres in size.

The soil of the Harrisville-Farr West area is Class II fine sandy clay loam overlaying a bed of clay at various depths of from 2 to 6 feet. On top of this clay is often found several inches of silt or silt clay mixture. Lower in the valley the land is sometimes found with a shallow lime hardpan at 14 to 18 inches.

There are 29 farms included in the study of irrigation records in tables 30 to 32, and these contain a total of 532.6 acres. If we assume an ideal application to be about 3.0 inches for peas and 4.0 inches for beets, alfalfa, and wheat, there are only 4 excessive irrigations recorded out of a total of 449.

Based on the above assumption, the average water storage capacity of the soil is about 4.5 inches of water, but the tables show that the average irrigation was 3.1 inches. Should the soil storage capacity be far less than assumed, the average application would not be excessive.

West Weber.

The town of West Weber is located 4 miles west of the Ogden City and is bounded on the east, north, and west by the Weber River. There

are 1623 acres of cropland and 120 acres of plowable pasture included in the 60 farms which compose the community.

The soil of West Weber is Class II sandy clay loam with clay subsoil. Irrigation water is received through the north branch of the Hooper Canal. The best lands are located too high for gravity flow so pumping is necessary to raise the water from 2 to 6 feet from the laterals to the land. Alfalfa, beets, potatoes, and small grain are the main crops.

Assuming that alfalfa root zone extends to a depth of 5 feet and other crops have a root zone depth of 4 feet, and also that the soil has a storage capacity of 1.1 inches per foot depth of soil, there are only two average applications of water above the ideal. Table 34 shows that these two excessive applications occured on farm 27 in the irrigation of alfalfa and sugar beets on farm 42.

The seasonal averages recorded on table 35 show: alfalfa 12.2 inches; sugar beets, 18.3 inches; potatoes, 11.8 inches; and wheat, 8.7 inches; while the average applications are 3.1, 3.0, 1.6, and 2.1 inches, respectively. The average application for all crops is 2.8 inches and the average water storage capacity is 4.5 inches. There is little to be desired in irrigation improvement as shown by the records on the 14 farms included in this study of West Weber.

Table 34. Summary tabulation by crops of water applications, depth of root zone, and water storage capacity of soils in West Weber area

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS			Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
						No. Of (7)	Total Depth in Inches (8)	Average Inches Applied (9)		
56	II	Alfalfa	5.0	5.0	1.1	4	8.2	2.0	5.5	5.0 t
41	II		5.0	5.0	1.1	4	6.0	1.5	5.5	5.0 t
44	II		3.0	5.0	1.1	5	8.3	1.7	5.5	5.0 t
26	II		5.0	5.0	111	3	6.9	2.3	5.5	4.0 t
64	II		5.0	5.0	1.1	3	8.8	2.9	5.5	4.5 t
96	II		2.5	4.0	1.1	2	9.0	4.5	5.5	4.5 t
63	II		6.0	5.0	1.1	4	20.2	5.0	5.5	4.5 t
53	II		5.0	5.0	1.0	4	9.1	2.3	4.0	5.0 t
55	II		3.0	5.0	1.1	5	13.0	2.6	5.5	5.0 t
27	II		9.0	5.0	1.1	5	32.2	6.4	5.5	5.0 t
		Totals	48.5	4.9	1.1	39	121.7	3.1	5.3	4.7 t
56	II	Potatoes	4.5	4.0	1.1	7	15.6	2.2	4.4	130 b
37	II		4.0	4.0	1.0	5	5.6	1.1	4.0	150 b
44	II		2.0	4.0	1.1	6	8.9	1.5	4.4	128 b
75	II		7.0	4.0	1.1	5	7.8	1.6	4.4	140 b
64	II		3.8	4.0	1.1	7	21.2	3.0	4.4	132 b
53	II		3.5	4.0	1.0	5	8.4	1.7	4.0	75 b
03	II		1.2	4.0	1.1⅛	7	14.6	2.1	4.4	182 b
		Totals	26.0	4.0	1.1	42	82.1	2.0	4.3	134.2 b

Table 34. (Continued)

Farm No. (1)	Soil Class (2)	Crop (3)	Acres (4)	Depth of Root Zone In Feet (5)	Approx. Storage Capacity Per Foot Of Soil (6)	IRRIGATIONS			Approx. Soil Storage Capacity (10)	Crop Yield Per Acre (11)
						No. Of (7)	Total Depth in Inches (8)	Average Inches Applied (9)		
37	II	Sugar beets	10.0	4.0	1.0	6	17.5	2.9	4.0	15.0 t
56	II		5.0	4.0	1.1	4	7.1	1.8	4.4	18.0 t
53	II		10.0	4.0	1.0	6	19.1	3.2	4.0	22.0 t
42	II		8.1	4.0	1.1	6	35.0	5.8	4.4	20.0 t
44	II		6.0	4.0	1.1	4	4.2	1.0	4.4	18.2 t
26	II		6.0	4.0	1.1	2	6.9	3.4	4.4	20.5 t
64	II		4.0	4.0	1.1	10	30.0	3.0	4.4	22.1 t
27	II		10.0	4.0	1.1	6	21.5	3.6	4.4	26.3 t
03	II		5.5	4.0	1.1	6	23.4	3.9	4.4	20.3 t
		Totals	64.6	4.0	1.1	50	164.7	3.3	4.3	20.3 t
56	II	Wheat	2.0	4.0	1.1	3	7.7	2.6	4.4	60.0 b
44	II		5.0	4.0	1.1	3	5.7	1.9	4.4	60.0 b
64	II		3.5	4.0	1.1	4	14.9	3.7	4.4	48.0 b
53	II		2.0	4.0	1.0	3	10.7	3.6	4.0	30.0 b
55	II		2.5	4.0	1.1	3	4.3	1.4	4.4	40.0 b
		Totals	15.0	4.0	1.1	16	43.3	2.7	4.3	47.6 b

Table 35. Relationship between water applied, soil storage capacity, and crop yields for the different soil classes in West Weber area

Soil Class (1)	Crop (2)	Acres (3)	Approx. Soil Storage Capacity (4)	Approx. Depth of Root Zone In Feet (5)	IRRIGATIONS No. Of (6)	IRRIGATIONS Total Depth in Inches (7)	IRRIGATIONS Average Inches Applied (8)	Difference Between Columns 4 and 8 (9)	Average Crop Yield Per Acre (10)
II	Alfalfa	48.5	5.3	4.9	39	121.7	3.1	-2.2	4.7 t
	Potatoes	26.0	4.3	4.0	42	82.1	2.0	-2.3	134.2 b
	Sugar beets	64.6	4.3	4.0	50	164.7	3.3	-1.0	20.3 t
	Wheat	15.0	4.3	4.0	16	43.3	2.7	-1.6	47.6 b
	Totals	154.1	4.5	4.2	147	411.8	2.8	-1.7	None

Summary of Lower Valley.

There are 162 farm records in table 36 in this study of the use of irrigation water in the lower valley of Weber County for the year 1938. Twenty of these records are for Class I soils and 142 are for Class II soils. There is a total of 2,372.1 acres of crops and 2600 individual irrigations. The 2599 irrigations have been classified in reference to the soil storage capacity into the per cent of irrigations which were in excess of soil storage capacity, and those which were equal to or less than the soil water storage capacity.

Thirty per cent or 779.7 irrigations were excessive while 70 per cent or 1799.3 irrigations were below the maximum water storage capacity of the soil. These figures indicate that the irrigation water supply is very carefully used in the lower valley of Weber County.

Table 36 shows approximately 66 per cent of the irrigation on Class I soil was excessive when compared with the water storage capacity of the soil. The 30 per cent total excessive irrigations includes those applications which exceeded the storage capacity by 0.1 or more per cent, so there are a large number within 0.5 per cent of soil capacity. In this range are included about 10 per cent of the entire 2599 and one may now conclude that 80 per cent of the farms of the lower valley are irrigated as near the ideal as is practicable under present systems of water application.

A further study of table 36 shows that Slaterville, although located on a Class II soil has a record of 82.4 per cent of applications above the soil storage capacity. This is due to the shallow soil which although it requires small and frequent applications was given heavy irrigations at less frequent intervals.

Table 36. Summary of the number of farms, crop acreage, total number of applications, per cent of applications above and below the soil water storage capacity in the Lower Valley. Also totals for the Ogden Valley and Lower Valley

Town	Total No. of Farms	Soil Class	Total Acres	Total No. Applications	Number of Applications in Per Cent Exceeding Capacity	Number of Applications in Per Cent Less than Capacity
Riverdale	12	I	211.0	349	66.7	33.3
Roy	8	I	229.0	355	65.5	34.5
	9	II	78.5	132	30.4	69.6
Hooper	21	II	292.5	253	15.5	84.5
Taylor	12	II	221.9	215	6.7	93.3
Kanesville	5	II	65.0	52	25.0	75.0
North Ogden	7	I	91.0	155	66.7	33.3
	6	II	68.2	53	46.7	53.3
Plain City	6	II	77.8	67	16.7	83.3
Pleasant View	6	II	77.5	117	18.2	81.8
Marriott	5	II	72.0	54	22.2	77.8
Warren & West Warren	14	II	107.9	127	9.5	90.5
Slaterville	7	II	93.1	75	82.4	17.6
West Weber	15	II	154.1	147	6.5	93.5
Harrisville	12	II	210.5	180	17.6	82.4
Farr West	17	II	322.1	269	26.7	73.3
Lower Valley	162		2372.1	2599	30.0	70.0
Weber Valley	29		689.3	380	57.0	43.0
Total	191		3061.4	2979	33.0	67.0

Table 37 indicates that alfalfa, sugar beets and early potatoes are irrigated with more care than other crops. Alfalfa was over-irrigated 16.8 per cent of the times water was applied, and 16.6 per cent of the applications on sugar beets were excessive, while barley was over-irrigated 35 per cent and berries 66 per cent of the times water was applied. Orchards and berries were grown on Class I soil which is more difficult to irrigate economically than Class II soil. Peas are usually over-irrigated due to the use of the flooding method of application and the loose open condition of the seed bed during the first irrigation. During subsequent irrigations the pea vines prevent the natural flow of water as it moves over the soil surface. Melons, although irrigated by the furrow method, show a heavy percentage of water application above the soil storage capacity. This is due to the vines which lodge in the furrows causing the water to move more slowly and requires an increase in time to move the full length of the field.

Table 37. Summary by crops of acreage, number of irrigations, seasonal application, per cent of application over and under the soil water storage capacity, average inches per irrigation and crop yields for the lower valley

Crop	Total Acres	Average No. Applic.	Ave. Total Depth in Inches	No. of Applic. in Per Cent: Exceed Cap.	Less than Cap.	Ave. in App.	Average Yield
Alfalfa	765.4	6.1	14.6	16.8	83.2	3.0	4.4
Barley	85.6	3.0	9.7	35.0	65.0	3.5	55 bu.
S. Beets	504.3	7.1	22.2	16.5	83.5	4.5	20 T
Peas	116.0	3.2	11.8	65.8	34.2	3.9	1.7 T
Orchard	379.5	10.9	25.9	43.2	46.8	2.3	
Early Potatoes	127.8	5.7	17.1	13.5	86.5	2.4	156 bu.
Berries	11.0	10.2	28.1	33.3	66.7	2.7	
Melons	12.6	10.0	22.7	60.0	40.0	2.4	
Onions	19.2	10.2	21.6	33.3	66.7	2.5	333 cwt.
Wheat	189.7	5.9	10.3	43.2	56.8	3.8	30.1 1/
Oats	44.0	1.9	5.8	18.2	81.8	3.1	60.5 bu.
Pasture	35.5	6.6	8.9	0.0	0.0	1.5	
Total	2290.6	6.6	198.7	28.5	71.5	3.0	

1/ Low yields due to rust in 1938.

Water losses.

Losses of irrigation water from the canal intake to the farm through seepage, transpiration, evaporation and poor control gates are very difficult to determine with any degree of accuracy.

Administrational losses, or that water which passes through the canal system without application to crops, vary greatly in the 13 canals studied. No attempt was made to segregate this loss of water from these other losses.

An attempt is made in table 38 to show a comparison of the acre feet of water diverted into the main canals of the county, and the acre feet of water applied to the soils on the farms. Approximately 180 farms with 302 crop records are included in this table for use as a cross section. In these 302 crop records are included 2404 acres, or 5.8 per cent, of the total acres served by 13 canals and 6 pumping plants.

Table 38 shows further that an average of 3.8 acre feet of water was turned into the canals and that 1.6 acre feet actually was applied to produce crops while 2.1 acre feet, or 58.3 per cent, was lost. Marriott Irrigation canal shows 76 per cent loss, which is the greatest loss shown in the 13 canals listed. The smallest loss occurred in Davis-Weber canal system and table 38 shows that the heaviest seasonal use was 2.8 acre feet in the same system.

Huntsville canal carried 5.4 acre feet during the season; and 3.3 acre feet, or 61.1 per cent, failed to reach the farms. The Mountain Canal, which parallels the Huntsville canal, lost about the same percentage of water. Both cross the gravel deposits in the mouth of South Fork Canyon.

Table 38. Distribution of water, by acre feet, from the Ogden and Weber rivers, by selected canals and acre feet supplied to soils for crop production on farms

Canal System (1)	Acres served (2)	Total 1/ acre feet diverted (3)	Acre feet per acre (4)	Acre feet applied to soil (5)	Loss in acre feet (6)	Loss in per cent (7)
Liberty Irr. Co.	1100	3411	3.1	2.1	1.0	32.2
Eden Irr. Co.	2100	6752	3.2	1.6	1.6	50.0
Huntsville Irr. Co.	1246	6758	5.4	2.1	3.3	61.1
Mt. Canal	963	3015	3.1	1.2	1.9	61.3
Marriott Irr. Co.	563	2797	5.0	1.2	3.8	76.0
North Ogden Irr. Co.	2922	9248	3.2	1.2	2.0	62.5
North Slaterville	517	2035	3.9	1.3	2.6	66.6
Plain City	2324	10372	4.5	1.9	2.8	57.7
Western Irr. Co.	2759	9420	3.4	1.5	1.9	55.9
Davis-Weber	10198	32306	3.2	2.8	0.4	12.6
Wilson Canal	3527	12540	3.5	1.1	2.4	38.6
Hooper Canal	10000	32422	3.2	1.1	2.1	68.7
Warren Canal	3000	11033	3.7	1.5	2.2	59.4
Pumping from Weber	269	360	1.3	1.3	0.0	00.0
Average	41468		3.6	1.6	2.1	58.3

1/ This total includes water which is diverted from canals through the wasteways and spillways.

CONCLUSION

In light of the foregoing it seems logical to conclude:

(1) There is a variation in the amount of water applied to various crops in the upper and lower valleys of Weber County; but when soil classes and water supply are considered, this difference is not outstanding. There are, however, a few farmers who apply several times more water than can be stored in the soil. Table 37 shows that 30.0 per cent of the 2979 applications in the lower valley were greater than the soil storage capacity.

(2) For convenience in this study, soils in Weber County were divided into two classes. Class I soils include the porous bench lands, while Class II soils are the fine sandy loams and fine sandy clay loams of lower areas.

(3) Crop yields are lighter on Class I soils in both valleys than on Class II soils, and the amount of water applied per irrigation is greater on Class I soils. There is a tendency to apply large quantities of water to the bench lands in the upper valley during the early summer when the supply of water is plentiful. This excessive application of water developed in the irrigation practice of the early settlers and the second generation who now farm the land is not yet convinced of the damaging effect of excessive irrigation.

In the Liberty area of the upper valley, 100 per cent of the applications on Class I soil exceeded the storage capacity of the soil, while 77 per cent applied water in excess of the soil storage capacity on Class I soil in the Huntsville area.

In the lower valley, three towns on Class I soils applied water in excess of the soil storage capacity, 66.7 per cent, 65.5 per cent, and 66.7 per cent of the total applications, respectively.

The Class II soils of Huntsville are also more judiciously irrigated than are those in Eden and Liberty, while in the lower valley the variation is not so great between towns. Seasonal use of water varied from 15 inches to 31.2 inches in the upper valley, and from 6.7 inches to 46 inches in the lower valley, depending, it would seem, on the supply available and method of application. If the record of one orchard and an 13.5-acre pasture in Huntsville are eliminated, the maximum seasonal use is 23.6 inches on alfalfa in the upper valley.

(4) Records of water applied are valuable in that they impress on the minds of the irrigators that there is a soil and water relationship which is the basis of intelligent use of these two basic natural resources.

(5) There were 859 applications made on Class I soil in the lower valley and of these, 66.3 per cent exceeded the water storage capacity of the soil. In the upper valley 136 applications were made on similar soil, and of this number 68.5 per cent were excessive. The respective comparisons on Class II soil show that out of 2120 applications in the lower valley, only 20.2 per cent exceeded the soil storage capacity; and of the 244 irrigations in the upper valley, 50.0 per cent were in excess of storage capacity. This appears to indicate a more careful use of water in the lower valley on both classes of soil.

(6) Sixty-seven per cent of the 2979 applications were within the soil storage capacity. If a 10 per cent increase in soil storage capacity of Class II soil, which comprises 70 per cent of the land, were

allowed, the percentage of excessive irrigations would be cut to approximately 12 per cent. This indicates a rather careful use of the water supply in Weber County.

(7) A change in methods of application from wild flooding to the use of furrow and boarder methods would lessen the labor involved in the irrigation practice and increase the efficiency in the use of the water supply.

(8) An increase in efficiency in application of the present water supply will not increase materially the water available for use on new land.

The problem is not one of more careful application on the farms of Weber County, so much as losses in transportation and the lack of storage to impound heavy uncontrolled early runoff on the Weber River.

(9) Losses chargeable to water conveyance include: seepage, leaky diversion gates, and administrative. Administrative losses include water which flows through the canal and waste ditches unused, but which is charged to the irrigation company.

No attempt was made to separate the water lost in the canals shown in table 38 into the three types of losses listed above.

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APPENDIX

Table 1. Water applications on 14 farms on soil classes I and II in Liberty area

Town Liberty Year 1938

Farm No.	CROP	Acres	IRRIGATIONS - Acre inches					Crop Yield	Size of stream c.f.s.		SOIL	
			No. of	Inches	Max.	Min.	Average		Min.	Max.	Surface	Sub
38	Alfalfa	6.0	1	16.0	16.0	16.0	16.0	1.5 t	0.31	1.0		
	Barley	3.0	1	4.0	4.0	4.0	4.0	40				
	Peas	5.0	2	6.7	4.5	2.2	3.3	2.6				
39	Alfalfa	5.0	1	6.0	6.0	6.0	6.0	1.5	0.63	1.0	fsl	
	Peas	5.0	2	9.1	4.8	4.3	4.5	1.5				
	Barley	4.0	1	4.5	4.5	4.5	4.5	47 b				
40	Alfalfa	18.5	5	10.9	3.9	1.1	3.0		1.0	1.75	scl	
	Peas	3.0	3	15.0	7.7	3.3	5.0					
41	Peas	7.0	2	4.4	2.4	2.0	2.2	2 t	0.64			
	Oats	10.0	2	4.8	2.5	2.3	2.4	75 b				
42	Barley	3.0	2	6.3	3.4	2.9	3.2	74 b	0.64		fsl	
	Peas	6.0	2	6.1	3.5	2.6	3.0	2½ t				
	Wheat	6.0	2	4.6	2.5	2.1	2.3	20 b				
	Oats	3.0	2	11.1	6.0	5.1	5.5	70 b				
43	Alfalfa	5.0	2	13.0	7.2	5.8	6.5	3 t	0.6	1.0	sl	
	Peas	3.0	3	13.8	7.2	3.0	4.6	2 t				
	Oats	5.0	3	4.0	2.2	0.4	1.3	40 b				
A	Oats	6.0	1	0.4	0.4	0.4	0.4	70 b	0.64			
	Alfalfa	4.0	3	1.7	0.6	0.5	0.6	4 t				
	Pasture	2.0	2	2.2	1.2	1.0	1.1	-				
45	Alfalfa	5.0	3	22.8	8.2	7.0	7.6	3 t	3.4	4.1	scl	
	Barley	2.0	2	15.2	8.2	7.0	7.6	50 b				
	Wheat	7.0	1	7.0	7.0	7.0	7.0	25 b				
	Oats	2.0	2	15.2	8.2	7.0	7.6	50 b				
	Alfalfa	16.0	4	16.8	4.6	3.0	4.2	3 t				
	Peas	5.0	3	7.5	2.7	2.3	2.5	1½ t				

Table 1. (Continued)

Town Liberty Year 1938

Farm No.	CROP	Acres	IRRIGATIONS - Acre inches No. of	Inches	Max.	Min.	Average	Crop Yield	Size of stream c.f.s. Min.	Max.	SOIL Surface	Sub
47	Alfalfa	8.0	2	18.8	15.2	3.6	9.4	3 t	1.35	1.36	sol	
	Alfalfa	8.0	2	14.4	10.8	3.6	7.2	3 t				
	Alfalfa	3.0	2	29.6	15.2	14.4	14.8	3 t				
	Peas	3.0	2	30.4	15.2	15.2	15.2	2 t				
	Peas	5.0	3	47.8	18.2	11.4	15.9	2 t				
	Wheat	4.0	2	22.8	11.4	11.4	11.4	30 b				
54	Peas	4.0	2	9.2	6.0	3.2	4.6	-				
	Alfalfa	4.5	3	16.8	6.4	5.1	5.6	-				
55	Alfalfa	20.0	4	9.1	4.4	0.2	2.3	1½ t	0.16	1.69	sl	
	Barley	2.0	1	22.8	22.8	22.8	22.3	55 b				
58	Alfalfa	10.0	6	55.1	12.7	5.0	9.2	2 t	1.1	2.8	sl	
	Peas	2.0	3	23.0	12.0	6.9	7.7	3 t				
	Oats	3.0	3	7.1	3.3	1.3	2.4	77½ b				
61	Alfalfa	35.0	4	53.6	33.9	2.1	13.0	1½ t	1.5	1.	sl	
	Barley	2.0	1	4.8	4.8	4.8	4.8	39 b				
	Wheat	5.0	2	26.0	20.2	5.8	13.0	32 b				
	Oats	4.0	2	29.4	16.8	12.6	15.0	47 b				
64	Alfalfa	25.5	2	38.0	25.0	13.5	19.0	2½ t	1.2	1.8	sol	
	Wheat	13.0	1	5.7	5.7	5.7	5.7	20 b				
	Barley	4.0	2	23.6	20.4	1.8	11.8	60 b				
	Barley	3.0	2	77.6	30.4	27.2	38.8	60 b				
	Alfalfa	6.0	7	6.8	2.0	0.6	1.0	-				
65	Alfalfa	8.0	11	30.6	9.0	0.7	2.8	3 t	1.5	2.7	sol	
	Barley	4.0	5	26.0	10.8	3.1	5.2	72 b				
	Oats	2.7	3	22.3	8.7	5.1	7.4	70 b				
	Alfalfa	4.0	3	22.5	12.0	3.5	7.5	3 t				

Table 2. Water applications on 6 farms on Class II soils in the Eden area

Town Eden Year 1938

Farm No.	CROP	Acres	IRRIGATIONS - Acre inches No. of	Inches	Max.	Min.	Average	Crop Yield	Size of stream c.f.s. Min.	Max.	SOIL Surface	Sub
22	Peas	2.0	3	16.1	6.7	4.6	5.4	1¼ t	1.7	2.6	scl	
	Barley	4.0	2	7.9	5.0	2.9	3.6	45 b				
	Oats	3.0	2	10.8	5.7	5.1	5.4	50 b				
25	Alfalfa	3.0	6	24.0	6.4	2.2	4.0	4 t	1.5	4.8	fscl	
	Beet seed	4.0	5	22.3	6.6	2.3	4.5	1.5 t				
	Peas	4.0	3	22.2	12.0	3.5	7.4	2.5 t				
	Wheat	3.0	3	17.7	6.4	5.6	5.9	-				
27	Beet seed	3.0	6	18.2	4.8	1.8	3.0	1.5 t	4.8	5.5	fscl	
	Barley	3.0	2	18.6	11.1	7.4	9.3	90 b				
	Barley	2.0	1	6.5	6.5	6.5	6.5	90 b				
	Oats	3.0	2	14.5	9.3	3.2	7.2	78 b				
	Peas	5.0	2	24.0	12.9	11.1	12.0	2 t				
	Peas	3.0	2	16.1	11.1	6.0	8.0	2 t				
	Peas	2.0	2	10.3	5.5	4.8	5.1	2 t				
29	Pasture	8.5	10	47.9	5.6	1.6	4.7		1.6	5.0	fsl	
	Wheat	2.0	2	11.4	5.7	5.7	5.7	31 b				
	Oats	4.0	3	14.6	5.7	3.5	4.9	65 b				
	Peas	4.0	3	13.2	6.5	2.7	4.4	1.8 t				
35	Alfalfa	8.0	2	8.1	5.6	2.5	4.0	3 t	2.2	2.5		
	Peas	12.5	3	9.3	4.5	1.6	3.1	1¼ t				
A	Alfalfa	20.0	7	21.7	5.2	1.2	3.1	3 t	2.0	1.0		
	Peas	8.5	4	12.4	4.2	2.7	3.1	1¼ t				
55	Peas	8.0	5	28.0	12.6	1.2	5.6	1¼ t	1.0	4.1		
	Barley	7.0	2	10.0	9.1	0.8	5.0	55 b				
	Oats	5.0	4	22.3	8.8	3.0	5.5	60 b				

Town **Huntsville** Year 1938

Farm No.	CROP	Acres	IRRIGATIONS - Acre inches No. of	Inches	Max.	Min.	Average	Crop Yield	Size of stream c.f.s. Min.	Max.	SOIL Surface	Sub
23	Alfalfa											
	Peas	3.0	3	14.1	5.7	3.3	4.7	2 t	2.0	3.7	sl	
	Oats	2.0	3	10.5	5.7	2.0	3.5	-				
	Wheat	3.0	3	17.8	7.6	4.0	5.9	-				
	Potatoes	1.0	5	16.2	4.0	2.6	3.2	-				
26	Alfalfa	8.0	9	30.3	8.5	1.5	3.4	2½ t	1.0	2.84	sl	g
	Peas	5.0	5	26.7	8.4	1.3	5.5	2 t				
	Pasture	5.0	9	23.6	2.8	0.8	2.6	-				
29	Barley	17.0	3	4.7	3.4	0.5	1.5	70 b			scl	
	Oats	11.0	3	12.4	6.2	3.0	4.1	75 b				
32	Alfalfa	1.0	12	83.0	15.0	3.5	7.0	2 t	3.0	5.0	gs	g
out	Orchard	2.0	12	81.2	15.0	4.0	6.7	2 t				
	Alfalfa	6.0	20	35.5	4.0	1.0	1.8	2 t	1.5	2.0		
	Peas	3.0	6	46.0	10.0	6.7	7.6					
71	Alfalfa	12.0	5	11.2	3.0	0.5	2.2	3½ t	1.0	3.0	sl	g
	Peas	4.0	3	15.5	9.0	3.0	5.2					
A	Alfalfa	20.0	3	6.4	3.5	0.7	2.1	3 t	1.3	4.0		
	Oats	4.0	1	3.3	3.3	3.3	3.3	71 b				
74	Alfalfa	120.0	2	4.9	4.1	0.8	2.5	3 t	1.0	2.38	sl	
	Alfalfa	40.0	2	12.0	7.7	4.3	6.0	3 t				
	Alfalfa	40.0	2	9.9	6.6	3.3	4.9	3 t				
75	Alfalfa	54.0	4	14.1	6.9	0.5	3.5	-	0.5	5.7	scl	
	Wheat	10.0	1	5.6	5.6	5.6	5.6	-				
76	Barley	3.0	2	4.2	2.5	1.7	2.1	-	0.8	1.3	sl	
	Potatoes	3.0	6	14.2	2.8	1.8	2.4	-				

Table 3. Water application on 21 farms on Class I and II soils in Huntsville area

Town Huntsville Year 1938

Farm No.	CROP	Acres	IRRIGATIONS - Acre inches					Crop Yield	Size of stream c.f.s.		SOIL	
			No. of	Inches	Max.	Min.	Average		Min.	Max.	Surface	Sub
00	Alfalfa	2.5	4	10.0	3.9	1.4	2.5	3 t	0.7	1.5	sl	
	Alfalfa	8.0	6	14.6	5.0	.8	2.4	3 t				
	Barley	7.0	4	8.1	2.6	1.5	2.0	63 b				
	Potatoes	2.0	3	9.9	4.1	2.8	3.3	135 b				
02	Peas	1.5	4	48.2	14.9	9.3	12.5	2 t			sl	g
	Wheat	2.0	2	23.6	13.9	10.3	11.8	35 b				
	Wheat	1.5	2	9.3	5.0	4.3	4.6	35 b				
03	Alfalfa	12.5	8	33.1	5.1	3.5	4.1	4 t	1.7	2.26		
	Peas	2.5	3	12.5	5.5	2.4	4.2	2 t				
	Potatoes	1.0	6	23.4	4.6	3.5	4.0	112 b				
	Wheat	3.0	2	10.2	5.4	4.8	5.0	45 b				
07	Alfalfa	4.0	6	18.3	4.0	1.5	3.0	5½ t	1.5	3.0	sl	
	Oats	1.0	5	18.5	6.5	.5	3.7	55 b				
	Peas	2.0	3	12.1	6.5	2.6	4.0	1 t				
13	Alfalfa	12.0	3	17.4	7.8	3.6	5.8	3 t	1.7	4.1	sl	
	Alfalfa	40.0	7	24.0	6.9	2.7	3.4	3 t				
14	Alfalfa	6.0	5	32.0	11.6	1.7	6.4	4 t	2.0	4.4	sl	
	Oats	5.0	2	16.6	11.2	5.4	8.3	90 b				
	Peas	5.0	3	19.9	10.1	4.1	6.6	1½ t				
	Potatoes	1.0	3	10.9	4.6	2.3	3.6	75 b				
19	Alfalfa	20.0	6	14.4	3.2	1.6	2.4	3 t	1.6	2.7	sl	
22	Alfalfa	37.0	5	18.4	4.2	2.8	3.7	3.5 t	1.7	2.26	sl	
	Barley	5.0	3	13.2	6.0	1.7	4.4	67 b				
	Peas	3.5	4	19.6	7.2	1.9	4.9	1.5 t				
	Potatoes	2.5	3	18.7	7.5	4.8	6.2	118 b				

Table 3 - Continued

Town **Huntsville** Year 1938

Farm No.	CROP	Acres	IRRIGATIONS - Acre inches					Crop Yield	Size of stream c.f.s.		SOIL	
			No. of	Inches	Max.	Min.	Average		Min.	Max.	Surface	Sub
77	Wheat	6.0	1	11.5	11.5	11.5	11.5	-	0.9	4.5		
80	Alfalfa	12.0	2	8.5	5.7	2.8	4.3	4 t	1.2	4.5		
	Peas	2.0	4	38.5	16.1	5.8	9.6	2 t				
	Barley	9.0	2	12.0	9.7	2.3	6.0	52 b				
82	Alfalfa	35.0	12	55.5	5.6	3.9	4.3	2½ t	3.5	5.0	sgl	c
86	Alfalfa	18.0	8	16.6	3.0	0.5	2.1	3 t	1.5	2.0	gl	
	Alfalfa	19.0	7	6.8	3.2	0.4	1.0	3 t				
	Peas	1.0	6	36.5	8.0	4.5	6.1	1.7 t				
99	Alfalfa	18.0	5	12.8	3.0	1.7	2.5	3 t	1.71		sl	
	Potatoes	5.0	2	10.9	6.1	4.8	5.5	150 b				
	Wheat	3.0	1	2.5	2.5	2.5	2.5	45 b				

Table 4. Water application on 5 farms on Class II soil in Plain City area

Town **Plain City** Year 1938

Farm No.	CROP	Acres	IRRIGATIONS - Acre inches				Crop Yield	Size of stream c.f.s.		SOIL	
			No. of	Inches	Max.	Min.	Average		Min.	Max.	Surface	Sub
355	Alfalfa	7.0	7	29.3	7.3	2.7	4.2	4.5 t	3.56	5.47		
	Barley	6.0	2	10.6	6.2	4.4	5.3	87 b			SL	
383	Alfalfa	7.0	3	5.7	2.6	1.4	1.9	5 t	2.0	2.26		
	Onions	1.0	5	20.0	4.6	3.4	4.0	400cwt				
	Potatoes	3.0	4	10.5	3.1	2.0	2.6	220 b				
296	Alfalfa	7.0	7	10.5	2.2	1.0	1.5	4 t	0.8	1.28	CL	
	Wheat	4.0	2	2.6	1.6	1.0	1.3	30 b				
944	Alfalfa	7.0	8	21.8	4.3	1.4	2.6	4 t	2.5			
	Beets	2.8	6	32 7	6.2	4.4	5.4	16 t				
747	Beets	9.0	6	26.7	5.1	4.2	4.4	28 t	4.25			
	Beets	13.0	7	27.2	4.5	3.9	3.9	28 t				
	Potatoes	12.5	6	27.2	4.2	3.4	4.5	250cwt				
	Seed Potatoes	2.5	5	17.0	4.2	2.6	3.4	130cwt				

Table 5. Water applied on seven farms in Salterville on Class II soil

Town Salterville Year 1938

Farm No.	CROP	Acres	IRRIGATIONS - Acre inches					Crop Yield	Size of stream c.f.s.		SOIL	
			No. of	Inches	Max.	Min.	Average		Min.	Max.	Surface	Sub
02	Alfalfa	10.0	3	10.6	5.7	1.5	3.5	5 t	2.2	3.7	ol	
	Peas	2.5	3	15.2	6.6	4.2	5.1					
	Wheat	4.0	2	8.2	4.2	4.0	4.1	32 b				
	Wheat	5.0	2	5.9	3.0	2.9	2.9	32 b				
	Alfalfa	8.0	3	9.2	3.7	2.2	3.1	5 t				
06	Barley	5.0	4	23.1	8.1	4.3	7.7	50 b	2.5	4.8		
	Barley	3.0	2	11.7	6.4	5.3	5.8	50 b				
	Oats	1.0	3	15.0	5.6	4.6	5.0	44 b				
	Peas	6.0	2	11.2	5.6	5.6	5.6					
12	Alfalfa	2.5	3	21.6	8.4	5.7	7.2	5 t	1.6	3.4		
	Beets	11.0	5	20.2	4.6	3.7	4.0	17 t				
	Wheat	1.0	1	5.9	5.9	5.9	5.9	30 b				
46	Alfalfa	6.0	4	7.3	2.4	1.0	1.8	6 t	1.3	2.0	sol	
	Beets	1.3	5	21.3	4.6	3.7	4.3	15 t				
	Corn	1.0	4	16.6	9.4	3.2	4.1	15 t				
63	Alfalfa	5.5	8	32.9	5.6	1.0	4.1	6 t	2.2	3.4		
	Wheat	5.0	2	6.9	3.7	3.2	3.5	24 b				
92	Beets	5.0	9	23.0	3.6	1.9	2.5	-	1.6	2.5		
	Potatoes	5.0	8	20.3	3.0	1.8	2.4	150 b				
94	Alfalfa	6.0	4	7.3	2.4	1.0	1.8	6 t	1.3	2.0		
	Beets	1.3	5	21.3	4.6	3.7	4.3	15 t				
	Corn	1.0	3	16.6	9.4	3.2	5.5	15 t				
	Pasture	6.0	4	7.0	2.3	1.7	1.8	-				

Table 6. Water application on 9 farms in Warren and West Warren on Class II soil

Town: Warren & West Warren Year 1938

Farm No.	CROP	Acres	IRRIGATIONS - Acre inches No. of	Inches	Max.	Min.	Average	Crop Yield	Size of stream c.f.s. Min.	Max.	SOIL Surface	Sub
1010	Alfalfa	2.25	8	20.7	3.7	1.3	2.5	8 t		2.36	SL	
	Potatoes	2.25	5	10.1	3.2	1.6	2.0	150cwt				
	Beets	1.0	4	17.4	6.0	3.0	4.3	20 t				
1153	Alfalfa	8.0	9	22.0	3.3	1.7	2.4	4 t	2.5	3.50	SCL	
	Beets	6.0	9	17.5	2.7	1.6	2.0	18-3/4t				
	Wheat	4.0	3	8.0	3.5	2.2	2.7	23½ b				
478	Alfalfa	4.0	6	26.7	5.1	3.6	4.4	5 t	2.95	2.95	SCL	
	Beets	6.5	10	32.5	3.6	2.8	3.2	21 t				
481	Beets	7.0	4	9.1	2.4	2.2	2.3	22 t		1.75	SL	
	Potatoes	3.0	3	11.3	5.1	2.5	3.8	80cwt				
	Wheat	3.0	1	4.7	4.7	4.7	4.7	40 b				
	Barley	6.0	1	1.7	1.7	1.7	1.7	21 b				
479	Potatoes	2.0	4	5.4	1.7	0.9	1.3	175cwt		1.75	SL	
	Wheat	2.0	2	3.8	2.1	1.7	1.9	45 b				
509	Barley	6.5	1	1.8	1.8	1.8	1.8	60 b		2.36	SCL	
	Onions	2.25	8	21.6	3.3	2.2	2.4	400cwt				
	Peas	2.17	3	8.5	3.3	2.1	2.8	1½ t				
511	Beets	8.0	5	14.0	3.1	2.7	2.5	25 t	2.26	2.40	SCL	
	Tomatoes	1.0	3	7.7	3.0	2.3	2.5	15 t				
	Wheat	1.0	1	2.4	2.4	2.4	2.4	40 b				
525	Beets	3.0	8	20.4	3.2	0.8	2.5	21 t		2.36	SL	
	Tomatoes	1.5	7	10.7	2.0	1.5	1.5	21 t				
580	Alfalfa	15.0	12	22.1	7.5	0.6	4.0	3½ t	1.9	3.16		
	Beets	11.0	13	22.2	3.1	0.8	1.7	17 t				

Table 7. Water application on seven farms in North Ogden on Class I soils

Town North Ogden Year 1938

Farm No.	CROP	Acres	IRRIGATIONS - Acre inches					Crop Yield	Size of stream c.f.s.		SOIL	
			No. of	Inches	Max.	Min.	Average		Min.	Max.	Surface	Sub
10	Peas	5.0	5	15.5	4.2	1.8	3.1	1 t			sgl	
	Tomatoes	7.0	9	19.9	4.4	0.7	2.2	7 t				
52	Alfalfa	4.0	10	8.6	1.0	0.4	0.9	3			sgl	
	Corn	1.0	7	16.8	2.4	1.6	2.4	-				
	Orchard	3.0	15	22.8	2.7	0.8	1.5	-				
66	Orchard	24.0	8	29.1	6.2	1.1	3.5	-			sgl	
	Beets	2.5	17	88.4	8.4	1.0	5.2	17½ t				
	Barley	3.0	4	17.2	6.3	0.2	4.3	60 b				
	Corn	2.5	10	31.1	7.2	0.4	3.1	-				
	Tomatoes	2.5	18	73.2	8.5	1.1	4.1	18 t				
69	Fruit	7.0	13	22.1	1.7	1.7	1.7	-			sgl	
79	Peaches	7.0	6	9.5	2.3	0.5	1.6	-	2.0	2.0		
	Cherries	7.0	8	14.4	2.9	0.5	1.8	-				
84	Orchard	4.0	12	36.0	3.0	3.0	3.0	-	0.5	0.5	sgl	sg
	Orchard	3.0	11	29.7	2.7	2.7	2.7	-				
	Tomatoes	1.0	11	44.0	4.0	4.0	4.0	6 t				
74	Alfalfa	2.0	5	66.4	18.0	9.0	15.5	3 t	1.5	1.5		
	Barley	4.5	2	18.2	10.2	8.0	9.1	42 b				
	Peaches	3.0	3	12.6	4.5	3.6	4.2	-				
	Tomatoes	1.5	5	62.4	16.0	8.0	12.5	7 t				
	Peas	3.0	3	31.5	12.0	8.0	10.5	1 t				

Table 9. Water applications on six farms in Pleasant View on Class II soil

Town **Pleasant View** Year 1938

Farm No.	CROP	Acres	IRRIGATIONS - Acre inches No. of	Inches	Max.	Min.	Average	Crop Yield	Size of stream c.f.s. Min.	Max.	SOIL Surface	Sub
10	Alfalfa	5.0	8	40.4	9.6	2.4	5.5	3½ t	1.0	1.0	sl	
	Orchard	2.0	5	14.1	6.0	2.4	2.8	-				
	Garden	0.5	7	63.4	9.6	1.0	9.5	-				
17	Alfalfa	10.0	6	20.1	3.6	3.1	3.7	3.5 t	1.3	1.3	cl	
	Orchard	6.0	10	16.0	1.6	1.6	1.6	-				
	Peas	2.0	1	1.3	1.3	1.3	1.3	1.3 t				
	Oats	4.0	1	3.2	3.2	3.2	3.2	62 b				
	Barley	4.0	1	3.2	3.2	3.2	3.2	57 b				
	Wheat	1.0	1	2.6	2.6	2.6	2.6	42				
18	Orchard	3.0	15	7.5	0.5	0.5	0.5	-				
	Alfalfa	2.0	15	7.5	0.5	0.5	0.5	2 t				
19	Alfalfa	4.0	3	9.3	4.2	2.5	3.1	4 t	.95	1.68	sl	
	Oats	3.0	1	3.4	3.4	3.4	3.4	60 b				
	Peas	2.0	2	11.0	6.8	4.2	5.5	2.1 t				
	Potatoes	1.0	3	15.0	5.0	5.0	5.0	110 b				
	Orchard	1.5	4	15.2	4.3	3.3	3.7	-				
	Tomatoes	1.0	4	24.0	7.0	5.0	6.0	7 t				
73	Alfalfa	1.0	1	7.2	7.2	7.2	7.2	4 t				
	Peas	1.0	3	12.4	7.9	2.1	4.1	1.5 t				
	Peaches	3.0	6	12.8	2.9	1.6	2.1	-				
83	Alfalfa	4.0	5	11.0	3.0	1.5	2.2	4 t	1.0	1.0	sl	
	Peas	3.0	3	7.3	3.3	2.0	2.4	2				
	Orchard	2.0	9	19.9	6.0	1.0	2.2	-				
	Orchard	10.0	9	14.3	2.4	1.0	1.6	-				
	Tomatoes	2.0	6	18.7	4.8	2.0	3.8	7				
	Tomatoes	3.0	6	22.9	7.3	2.0	3.8	9				
	Wheat	2.0	1	3.0	3.0	3.0	3.0	20 b				
	Garden	1.0	4	8.6	2.6	2.0	2.1	-				
	Oats	3.0	1	2.0	2.0	2.0	2.0	73				

Table 9. Water application on 7 farms on Class II soil in West Weber area

Town **West Weber** Year 1938

Farm No.	CROP	Acres	IRRIGATIONS - Acre inches					Crop Yield	Size of stream c.f.s.		SOIL	
			No. of	Inches	Max.	Min.	Average		Min.	Max.	Surface	Sub
537	Beets	10	6	17.5	3.0	1.4	2.9	15t		1.25	SCL	
	Peas	2	3	6.6	2.4	2.1	2.2	1½ t				
	Potatoes	4	5	5.6	1.5	1.0	1.1	150cwt				
542	Alfalfa	9.5	5	44.6	10.7	6.6	8.9	4 t		3.33	SCL	
	Beets	8.1	6	35.0	7.3	5.1	5.8	21.3 t				
555	Alfalfa	3	5	13.0	3.5	1.7	2.6	5 t		1.30	SCL	
556	Alfalfa	3	4	8.2	2.8	1.1	2.5	5 t	0.8	1.75	SCL	
	Beets	5	4	7.1	2.4	0.9	1 8	18 t				
	Potatoes	4.5	7	15.6	2.8	2.0	0.8	130cwt				
	Wheat	2.	3	7.7	4.2	1.6	2.9	10 b				
	Tomatoes	1	4	5.9	2.6	1.0	1.5	12 t				
2327	Alfalfa	9	5	32.2	8.7	3.6	6.4	5 t	1.4	3.6	SL	
	Alfalfa	2	4	17.3	5.7	2.8	4.3	3 t				
	Beets	10	6	21.5	7.3	3.2	3.6	26.3 t				
	Corn	7	6	29.1	7.2	3.4	4.8	17 b			SL	
564	Alfalfa	5	3	8.8	3.6	2.4	2.9	4.5 t	1.5	2.0	SL	
	Beets	4	10	30.0	4.6	2.6	3.0	24.4 t				
	Potatoes	3.8	7	21.2	4.0	1.6	3.0	132cwt				
	Oats	2	2	9.9	6.9	3.0	5.0	65 b				
	Wheat	3.5	4	14.9	4.4	2.1	3.7	35 b				
553	Alfalfa	5	4	9.1	3.4	1.6	2.3	5 t	1.0	2.26	S1	
	Potatoes	3.5	5	8.4	2.0	1.3	1.7	175cwt				
	Tomatoes	1.5	5	10.3	3.4	1.0	2.5	12 t				
	Wheat	2	3	10.7	4.7	2.6	3.6	30 t				

Table 10. Water application on 17 farms in Farr West on Class II soils

Town Farr West Year 1938

Farm No.	CROP	Acres	IRRIGATIONS - Acre inches No. of	Inches	Max.	Min.	Average	Crop Yield	Size of stream c.f.s. Min.	Max.	SOIL Surface	Sub
37	Alfalfa	19.0	6	14.2	3.0	0.9	2.4	4 t	0.8	1.4		
	Beets	7.0	6	14.1	3.0	1.8	2.3	21½ t				
	Peas	2.0	2	6.0	4.4	1.6	3.0	2 t				
	Wheat	3.0	1	1.9	1.9	1.9	1.9	30 b				
38	Alfalfa	8.0	9	25.9	4.2	1.6	2.8	6 t	1.2	4.1	l	
41	Alfalfa	35.0	5	13.2	7.3	0.8	2.6	5 t	2.1	4.3		
43	Alfalfa	14.0	6	31.3	6.6	4.3	5.2	3.5 t	1.9	3.65		
	Alfalfa	25.0	4	15.6	6.0	0.8	3.9	4 t				
	Seed beets	2.0	7	55.2	9.0	5.2	7.9	22.3 t				
	Potatoes	2.0	11	64.8	10.8	2.9	6.9	213 b				
	Sugar beets	12.0	10	64.0	8.4	4.6	6.4	22.3				
	Garden	1.0	13	86.7	10.0	3.7	6.6	-				
44	Alfalfa	2.0	4	15.1	5.4	1.7	3.8	4 t	1.0	4.3	cl	
	Wheat	2.5	2	10.9	5.7	5.2	5.5	58 b				
45	Alfalfa	16.0	5	24.4	7.7	1.2	4.8	5 t	1.4	2.6	gl	sg
	Barley	4.5	1	7.7	7.7	7.7	7.7	72 b				
	Beets	4.5	9	44.1	8.4	1.6	4.9	24 t				
	Wheat	3.0	3	8.6	4.0	1.2	2.8	31 b				
	Potatoes	2.5	7	30.7	6.7	2.5	4.4	180 b				
46	Alfalfa	4.0	5	19.6	3.4	1.8	3.9	6 t	2.26	3.43		
	Beets	3.0	7	19.6	4.1	1.9	2.8	25 t				
	Peas	1.0	2	6.8	3.4	3.4	3.4	2 t				
	Wheat	1.0	3	15.0	9.2	1.7	5.0	35 b				
48	Alfalfa	2.0	5	14.3	4.0	1.0	2.9	5⅓t	1.4	2.6	cl	g
	Beets	6.5	6	21.5	4.6	1.4	3.6	21 t				
	Potatoes	3.3	10	29.8	4.6	2.4	2.9					

Table 10 - Continued

Town **Farr West** Year 1938

Farm No.	CROP	Acres	IRRIGATIONS - Acre inches					Crop Yield	Size of stream c.f.s.		SOIL	
			No. of	Inches	Max.	Min.	Average		Min.	Max.	Surface	Sub
50	Alfalfa	14.0	13	15.3	3.3	0.7	1.2	3 t	1.28	2.26	sl	
	Beets	7.0	14	26.6	2.8	1.5	1.8	23 t				
53	Alfalfa	13.0	4	28.4	8.7	2.4	7.1	3 t	1.3	2.26		
58	Alfalfa	12.0	7	14.7	3.4	1.7	211	-	1.9	3.6		
66	Alfalfa	4.0	5	23.6	4.9	3.9	4.7	2 t	1.5	2.5	sl	
	Alfalfa	5.0	5	17.2	4.5	1.9	3.4	2 t				
	Beets	4.0	6	35.7	7.5	3.1	5.1	17 t				
72	Alfalfa	5.0	10	32.6	4.2	2.8	3.2	4 t	2.2	4.1	sl	
	Beets	5.0	8	24.3	4.1	2.8	3.0	24 t				
	Peas	3.0	3	11.6	4.1	3.4	3.7	1½ t				
	Wheat	4.0	2	7.5	4.1	3.4	3.7	40 b				
	Potatoes	1.0	3	11.5	4.2	3.1	3.6	150 b				
76	Alfalfa	12.0	6	15.3	3.9	1.1	2.5	3½ t	1.5	2.26		
	Beets	3.0	10	28.3	4.5	1.8	2.8	12 t				
	Wheat	1.0	2	11.3	6.0	5.3	5.6	55 b				
78	Alfalfa	6.0	6	18.9	3.8	0.9	3.1	6 t	2.26	3.4		
	Beets	13.0	6	20.4	4.6	2.2	3.4	25 t				
	Peas	3.0	2	6.8	4.5	2.3	3.4	2.5 t				
87	Alfalfa	6.0	7	18.2	5.6	1.1	2.6	5½ t	0.8	1.26	1	
	Beets	12.0	12	29.2	3.6	1.6	2.4	20 t				
95	Alfalfa	8.5	6	16.1	2.5	1.4	2.7	3¼ t	0.8	1.26		
	Beets	3.5	4	14.7	6.8	2.0	3.7	25 t				

Table 11. Water applications on twelve farms in Harrisville on Class II soils

Town Harrisville Year 1938

Farm No.	CROP	Acres	IRRIGATIONS - Acre inches					Crop Yield	Size of stream c.f.s.		SOIL	
			No. of	Inches	Max.	Min.	Average		Min.	Max.	Surface	Sub
47	Alfalfa	6.0	3	7.3	4.4	1.3	2.6	4 t	0.8	1.26		
	Beets	6.0	8	29.4	4.4	2.2	3.7	10 t				
50	Alfalfa	5.0	10	24.0	2.6	1.9	2.4	3 t	0.84	1.0		
	Beets	3.0	6	19.7	3.7	2.8	3.3	18 t				
	Beets	4.0	6	18.2	3.5	2.4	3.1	18 t				
	Barley	2.0	2	4.7	2.5	2.2	2.3	-				
67	Alfalfa	4.0	9	10.8	1.3	1.1	1.2	4 t	0.8	1.5		
	Beets	2.0	8	15.3	2.3	1.4	1.9	18.5 t				
	Potatoes	1.0	7	7.4	1.3	0.8	1.6	-				
	Pasture	10.0	12	13.8	1.4	1.0	1.2	-				
82	Alfalfa	5.5	6	23.3	5.5	2.5	4.0	6 t	1.49	1.68		
	Beets	2.5	6	21.5	4.8	1.8	3.6	20 t				
	Wheat	8.0	3	10.0	4.9	0.2	3.3	37				
83	Alfalfa	4.0	7	16.6	4.4	1.6	2.3	5 t	0.8	1.0		
	Beets	12.0	7	8.9	1.5	1.1	1.3	19⅛ t				
	Peas	3.0	3	9.5	5.1	2.2	3.2	2 t				
	Wheat	3.0	1	3.3	3.3	3.3	3.3	50 b				
84	Alfalfa	2.5	5	11.9	2.9	1.6	2.4	5 t	0.2	0.6		
	Beets	2.5	7	17.7	3.8	2.1	2.5	20 t				
	Oats	1.0	1	3.0	3.0	3.0	3.0	50 b				
	Garden	1.0	8	17.9	3.0	1.8	2.2	-				
	Pasture	2.0	5	10.8	3.0	1.8	2.1	-				
85	Beets	11.0	6	17.8	3.7	2.1	3.0	21½ t	1.6	2.9		
	Pasture	10.0	10	16.6	2.9	1.3	1.6	-				
	Wheat	12.0	2	7.1	3.5	0.4	3.4	33 b				

Table 11 - Continued

Town **Harrisville** Year 1938

Farm No.	CROP	Acres	IRRIGATIONS - Acre inches					Crop Yield	Size of stream c.f.s.		SOIL	
			No. of	Inches	Max.	Min.	Average		Min.	Max.	Surface	Sub
86	Alfalfa	25.0	4	16.1	3.1	1.4	4.0	2½ t	1.4	3.6		
	Beets	10.0	6	20.1	4.9	2.1	3.3	21 t				
	Peas	4.0	3	11.8	5.4	1.9	3.9	-				
	Wheat	13.0	1	7.2	7.2	7.2	7.2	35 b				
	Wheat	10.0	1	4.5	4.5	4.5	4.5	35 b				
87	Alfalfa	3.0	5	16.8	5.0	2.2	3.3	5 t	1.9	3.6		
	Alfalfa	1.0	4	12.6	3.7	2.7	3.2	5 t				
	Beets	3.0	6	19.4	4.5	2.1	3.5	10 t				
	Wheat	3.0	3	13.2	6.6	2.8	4.4	20 b				
	Garden	0.5	8	25.9	4.8	1.8	3.2	-				
92	Alfalfa	4.0	4	14.4	5.7	2.5	3.6	2½ t	1.9	3.8		
98	Alfalfa	8.0	2	2.8	1.6	1.2	1.4	-	0.68	1.0		
	Beets	5.0	4	19.8	7.4	1.4	4.9	16.8				
99	Beets	3.5	7	17.2	2.8	2.1	2.5	18½ t	0.6	0.9		

Table 12. Water application on farms on Class II soil in Taylor area

Town Taylor Year 1938

Farm No.	CROP	Acres	IRRIGATIONS - Acre inches				Crop Yield	Size of stream c.f.s.		SOIL	
			No. of	Inches	Max.	Min.	Average		Min.	Max.	Surface	Sub
02	Alfalfa		60.0	4	21.4	6.2	3.9	5.3	3 t			sl
	Wheat		10.5	2	10.6	5.6	5.0	5.3	30 b			
	Oats		3.5	2	11.2	5.6	5.6	5.6				
05	Wheat		6.0	4	16.8	5.0	3.5	4.2	27 b			sl
	Barley		4.0	3	13.2	6.7	3.2	4.4	35 b			
19	Alfalfa		4.0	2	3.3	2.0	1.3	1.6	3 t	0.95	1.3	sl
	Peas		2.0	5	10.7	3.2	1.2	2.1	1 t			
	Potatoes		1.0	6	12.7	3.2	1.5	2.1	60 b			
	Melons		1.0	7	11.9	4.0	0.5	1.7	4 t			
21	Beets		4.75	2	3.6	2.0	1.6	1.8	27 t			sl
	Peas		1.0	2	1.6	0.8	0.8	0.8	2 t			
	Potatoes		5.0	3	7.5	3.2	1.9	2.5	200 b			
	Wheat		1.5	2	2.7	1.1	1.6	1.3	10 b			
43	Alfalfa		3.5	11	23.8	3.6	0.4	2.2	4 t	0.52	0.89	scl
	Beets		1.5	8	20.9	3.6	1.7	2.5	12 t			
	Potatoes		1.5	9	16.3	2.3	1.3	1.4	260 b			
61	Barley		4.0	1	1.0	1.0	1.0	1.0	30 b			sl
	Potatoes		5.0	3	5.6	2.1	1.7	1.8	100 b			
	Wheat		5.0	3	4.4	1.8	1.3	1.5	6 b			
64	Wheat		3.0	2	5.3	2.8	2.5	2.6	30 b	1.5	2.1	scl
	Barley		2.0	1	4.2	4.2	4.2	4.2	60 b			
	Alfalfa		4.0	4	13.0	4.2	2.3	3.2	3 t			
	Peas		1.5	2	5.3	2.8	2.5	2.6	2 t			
	Beets		5.5	7	19.4	4.9	1.5	2.8	16 t			
	Potatoes		2.0	3	5.7	2.7	1.5	1.9	150 b			

Table 12 - Continued

Town **Taylor** Year 1938

Farm No.	CROP	Acres	IRRIGATIONS - Acre inches					Crop Yield	Size of stream c.f.s.		SOIL	
			No. of	Inches	Max.	Min.	Average		Min.	Max.	Surface	Sub
83	Alfalfa	11.0	5	17.5	4.5	2.0	3.5	3½ t	0.81	2.53	sl	
	Wheat	6.0	4	13.3	5.0	1.6	3.3	28 b				
	Beets	2.0	5	13.4	3.7	1.9	2.7	16 t				
	Potatoes	2.0	7	14.1	3.7	0.8	2.0	125 b				
86	Alfalfa	2.25	12	38.0	4.7	3.0	3.2	2½ t	1.0	2.59	scl	
	Beets	2.0	9	54.0	7.8	1.5	6.0	15 t				
	Tomatoes	1.0	6	16.9	3.9	1.3	2.8	10 t				
88	Alfalfa	11.0	6	11.1	2.1	1.4	1.8	3⅛ t	0.9	1.3	scl	
	Peas	1.0	3	4.9	2.0	1.3	1.6	1⅛ t				
	Barley	1.5	4	8.6	2.4	1.9	2.2	60 b				
	Oats	1.5	2	4.1	2.1	2.0	2.0	62				
	Potatoes	5.0	11	14.5	1.4	1.1	1.3	189				
93	Alfalfa	3.0	5	17.9	5.0	1.9	3.6	4 t	2.0	1.4	scl	
	Beets	6.5	6	14.0	4.2	2.4	2.3	21 t				
	Oats	4.0	3	11.6	6.0	2.5	3.8	63 b				
	Tomatoes	2.0	8	15.0	2.7	0.9	1.9	12 t				
96	Alfalfa	5.5	5	3.9	1.0	0.4	0.8	6½ t	0.4	0.75	scl	
	Beets	5.0	4	4.3	1.3	0.7	1.1	23 t				
	Potatoes	4.0	8	8.6	2.5	0.5	1.1	207 b				
	Wheat	3.0	4	2.8	0.9	0.5	0.7	47 b				

Table 13. Water applications on five farms in Marriott on Class II soil.

Town **Marriott** Year 1938

Farm No.	CROP	Acres	IRRIGATIONS - Acre inches				Crop Yield	Size of stream c.f.s.		SOIL	
			No. of	Inches	Max.	Min.	Average		Min.	Max.	Surface	Sub
55	Beets	2.5	6	27.5	5.4	3.7	4.6	21 t	1.6	3.16	sl	
	Potatoes	6.5	4	12.0	4.3	2.0	3.0	110 b				
	Wheat	2.0	3	15.2	6.4	3.6	5.1	47 b				
56	Beets	10.0	4	14.0	5.5	1.6	3.5	22 t	2.0	2.5	sl	
	Pasture	12.0	9	10.2	1.5	0.7	1.1	—				
61	Beets	9.0	9	22.4	3.1	1.7	2.5	19 t	1.8	2.5	sl	
	Barley	8.0	2	4.9	2.1	2.8	2.5	58				
76	Beets	15.0	11	36.6	5.5	1.0	3.6	17 t	1.7	2.2		
80	Beans	7.0	6	2.2	0.3	0.2	0.4	2½ t	.233	.233	sl	

Table 14. Water applications on eight farms on Class I soils in Roy

Town Roy Year 1938

Farm No.	CROP	Acres	IRRIGATIONS - Acre inches					Crop Yield	Size of stream c.f.s.		SOIL	
			No. of	Inches	Max.	Min.	Average		Min.	Max.	Surface	Sub
18	Alfalfa	1.0	11	109.5	14.4	6.8	9.9	5 t	3.45	3.45	sgl	gs
	Apples	3.0	10	48.0	6.8	3.4	4.8	-				
	Peaches	2.0	8	33.6	5.9	2.5	4.2	-				
33	Alfalfa	5.0	7	17.3	3.1	1.6	2.5	1 t	2.58	2.58	sgl	sg
	Peas	6.0	5	13.4	4.8	1.3	2.7	2 t				
	Apricots	3.0	35	115.5	3.3	1.0	3.3	-				
	Apples	8.0	22	44.1	3.6	1.0	2.0	-				
	Peaches	4.0	14	47.4	5.2	1.0	3.4	-				
	Cherries	4.0	12	30.8	3.5	1.3	2.6	-				
46	Alfalfa	15.0	9	33.6	6.8	1.7	3.7	4 t	2.2	2.2	sl	
	Peas	6.0	4	32.2	10.2	4.4	8.5	2 t				
	Cherries and Apricots	14.0	6	24.1	4.2	1.3	4.1	-				
	Apples	20.0	9	29.5	5.4	1.9	3.3	-				
	Peaches	7.0	8	25.0	4.1	1.9	4.1	-				
47	Beans	1.0	12	49.1	3.5	1.0	4.1	-	.71	.71	1	c
	Strawberries	3.0	14	63.1	3.7	3.0	4.5	-				
49	Orchard	13.0	16	24.6	2.9	0.5	1.5	-	2.2	2.2	sgl	gs
	Peas	3.0	4	21.3	7.3	1.5	5.3	-				
	Tomatoes	3.0	13	55.0	5.1	2.2	4.2	7 t				
	Vegetables	1.0	12	33.0	4.4	2.2	2.8	-				
51	Orchard	31.0	17	41.4	2.5	2.4	2.4	-	0.75	0.75	sgl	gs
	Orchard	5.0	20	45.6	2.4	2.4	2.4	-				

Table 14 - Continued

Town Roy Year 1938

Farm No.	CROP	Acres	IRRIGATIONS - Acre inches					Crop Yield	Size of stream c.f.s.		SOIL	
			No. of	Inches	Max.	Min.	Average		Min.	Max.	Surface	Sub
53	Orchard	30.0	23	32.6	1.7	0.8	1.4		3.45	3.45	sgl	sg
	Melons	5.0	10	25.8	4.4	1.7	2.6					
72	Alfalfa	15.0	18	26.6	3.4	0.2	1.5	3 t	.75	.75	sg	
	Tomatoes	3.0	15	79.7	13.3	3.7	5.3	8 t				
	Peas	4.0	3	8.8	3.0	2.9	2.9	1½ t				
	Orchard	10.0	10	18.4	3.4	0.4	1.8					
	Strawberries	1.0	10	17.2	4.5	2.0	1.7					
	Small fruit	2.0	11	24.0	3.0	2.0	2.4					
	Melons	3.0	10	29.5	4.0	1.2	2.9					

Table 15. Water applications on nine farms on Class II soils in Roy

Town Roy Year 1938

Farm No.	CROP	Acres	IRRIGATIONS - Acre inches					Crop Yield	Size of stream c.f.s.		SOIL	
			No. of	Inches	Max.	Min.	Average		Min.	Max.	Surface	Sub
01	Alfalfa	5.0	6	14.6	2.9	1.8	2.4	5 t	1.2	1.6	sl	
	Alfalfa	7.0	5	11.2	2.6	1.8	2.2	5 t				
	Beets	6.0	6	12.0	3.0	1.1	2.0	17 t				
	Peas	5.0	3	4.4	1.5	1.4	1.5	2½ t				
02	Beets	6.0	12	11.2	2.0	0.6	0.9	23 t	1.0	2.6	sl	sl
	Peas	1.5	8	19.3	2.6	2.2	2.4	1 t				
	Tomatoes	2.0	12	90.5	8.7	6.1	7.5	13 t				
04	Barley⅓	1.0	1	1.0	1.0	1.0	1.0	53 b	.158	0.158		
	Tomatoes	3.0	5	14.6	4.0	0.7	2.9	15 t				
07	Beets	6.5	6	21.1	4.7	2.9	3.5	26 t	2.8	2.8		
	Potatoes	1.5	5	26.4	6.4	4.3	5.3	175 b				
	Tomatoes	0.5	6	95.0	19.2	14.0	16.0	15 t				
15	Peas	1.0	4	10.8	3.2	2.4	2.7	1 t	.37	.37	l	c
	Potatoes	1.5	6	15.3	3.2	1.3	2.5	175 b				
	Wheat	2.5	4	15.0	4.8	2.9	3.7	31 b				
20	Alfalfa											
	Beets	7.0	9	39.6	6.7	3.2	4.4	21 t	1.6	2.1	sl	c
	Peas	3.5	4	30.2	9.2	6.0	7.5	2 t				
	Tomatoes	3.0	4	17.1	5.0	3.7	4.3	8 t				
	Wheat	5.0	2	11.7	7.6	4.1	5.8	28 b				
26	Alfalfa	3.0	4	6.1	1.7	1.2	1.5	6 t	1.2	1.7	sl	c.
	Potatoes	2.0	7	11.4	2.6	1.2	1.6	203 b				
	Tomatoes	2.0	3	4.6	1.7	1.4	1.5	15 t				
	Garden	3.0	10	14.3	1.9	0.8	1.4	-				

Table 16. Water applications on twelve farms on Class I soils in Riverdale

Town Riverdale Year 1938

Farm No.	CROP	Acres	IRRIGATIONS - Acre inches No. of	Inches	Max.	Min.	Average	Crop Yield	Size of stream c.f.s. Min.	Max.	SOIL Surface	Sub
09	Peas	2.0	3	14.1	7.7	3.1	4.7	1½ t	1.04	1.04	sl	s
	Potatoes	4.0	5	15.0	6.0	2.7	3.0	122 b				
	Apricots	3.0	4	15.8	4.7	2.7	3.9					
	Peaches	3.0	4	15.0	4.7	2.7	3.8					
10	Onions	15.0	22	29.7	3.4	0.4	1.4	200	.458	1.39		
11	Orchard	14.0	11	37.7	4.0	2.7	3.4	-	1.44	1.44	gl	sg
	Orchard	16.0	12	30.5	5.4	1.9	2.5	-				
	Young Orchard	25.0	14	33.4	3.5	1.2	2.7	-				
	Grapes	2.0	11	30.4	3.5	1.4	2.8	-				
	Dewberries	2.0	11	26.6	3.5	1.4	2.4	-				
13	Orchard	9.0	18	23.9	1.0	2.7	2.7	-	1.33	1.33		
33	Orchard	7.0	13	12.1	0.9	0.3	0.8	-	1.33	1.33	sgl	sg
	Melons	1.0	11	14.0	2.1	1.4	1.3	-				
35	Alfalfa	2.0	7	34.5	5.8	0.7	4.9	4	1.38	1.38		
	Peas	1.5	5	19.2	4.7	1.4	3.8	1.2				
	Orchard	8.0	17	33.5	2.8	1.7	2.0	-				
	Tomatoes	2.0	12	39.9	4.8	2.8	3.3	12				
39	Alfalfa	7.0	7	20.1	5.2	1.0	2.9	5 t	1.38	1.38	sl	gs
	Orchard	14.0	6	25.9	5.4	3.2	4.3					
	Tomatoes	6.0	7	20.7	4.2	0.7	3.0	12 t				
58	Alfalfa	4.0	4	16.3	7.5	1.9	4.1	5½ t	1.6	2.1	cl	gs
	Beets	2.0	7	25.4	4.3	3.0	3.6	22 t				

Table 16 - Continued

Town **Riverdale** Year 1938

Farm No.	CROP	Acres	IRRIGATIONS - Acre inches					Crop Yield	Size of stream c.f.s.		SOIL	
			No. of	Inches	Max.	Min.	Average		Min.	Max.	Surface	Sub
65	**Alfalfa**	4.0	6	16.9	4.1	1.1	2.8	6 t	.33	.33	gsl	g
	New Alfalfa	3.0	6	20.1	5.1	2.4	3.3	-				
	Oats	3.0	2	13.9	7.8	6.1	6.9	90 b				
	Orchard	1.0	3	19.9	9.3	5.3	6.6	-				
76	**Orchard**	4.0	16	42.8	3.7	1.3	2.6	-	1.38	1.38		
	Melons	2.0	15	42.0	3.7	2.1	2.8	-				
	Tomatoes	3.0	12	42.3	3.7	1.8	3.5	10 t				
77	**Alfalfa**	3.5	16	59.1	7.2	1.7	3.7	3 t	1.38	1.38	sgl	
	Barley	2.0	6	27.9	8.4	2.8	4.6	30 b				
	Apricots	5.0	8	14.3	3.1	1.6	1.8	-				
	Peaches, old	5.0	15	31.8	3.4	1.6	2.1	-				
	Peaches	5.0	12	25.9	4.5	1.4	2.2	-				
	Strawberries	1.0	4	7.5	4.9	2.8	1.9	-				
84	**Orchard**	20.0	17	55.7	7.8	1.0	3.2	-	.55	.55		

Table 17. Water applications on 21 farms on Class II soils in Hooper

Town Hooper Year 1938

Farm No.	CROP	Acres	IRRIGATIONS - Acre inches No. of	Inches	Max.	Min.	Average	Crop Yield	Size of stream c.f.s. Min.	Max.	SOIL Surface	Sub
02	Beets½	4.0	6	15.5	4.0	1.9	2.3	18 t	1.2	2.4	s	s
	Barley	4.0	1	5.0	5.0	5.0	5.0	50 b				
	Onions	1.0	6	15.2	4.8	1.3	2.5	8 t				
	Melons	4.0	6	15.9	3.4	1.6	2.6	10 t				
	St. beans	6.0	3	3.7	1.5	0.9	1.2	4 t				
03	Beets	6.0	8	20.5	3.1	1.9	2.3	22 t	1.8	2.4		
	Peas	5.0	5	13.8	3.2	2.3	2.7	2 t				
15	Beets	5.0	4	13.9	4.4	3.1	3.5	17 t	1.3	2.0		
	Potatoes	0.5	4	20.2	6.0	3.9	5.0	40 b				
	Wheat	4.5	3	10.5	4.2	2.7	3.5	32 b				
19	Alfalfa	2.0	2	5.7	3.0	2.7	2.8	4 t	1.1	1.5	cl	
	Beets	8.0	4	10.3	3.0	2.1½	2.6	12 t				
	Oats	6.0	2	6.2	3.6	2.6	2.6	70 b				
21	Alfalfa	12.0	8	14.4	4.1	1.1	1.8	3.5	1.2	1.9		
	Potatoes	1.0	6	32.4	6.0	4.5	5.4	-				
	Wheat	6.0	4	18.6	8.7	2.6	4.6	-				
22	Alfalfa	5.0	5	14.1	3.6	2.5	2.8	4 t	.75	1.28	cl	
	Wheat	4.0	2	6.5	3.6	2.9	3.3	27 b				
31	Barley	3.5	2	7.2	4.6	2.6	3.6	85 b	0.8	2.2		
	Peas	6.0	4	14.0	3.8	3.0	3.7	1½ t				
	Pasture	1.5	2	2.8	1.5	1.3	1.4	-				
41	Alfalfa	7.0	5	5.7	2.4	0.9	111	3½ t	1.0	1.75		
	Beets	6.5	8	18.0	4.1	1.0	2.2	17 t				
43	Beets	5.0	3	8.0	3.2	1.7	2.7	14 t	1.1	2.8	sl	

Table 17. Continued

Town Hoover Year 1938

Farm No.	CROP	Acres	IRRIGATIONS - Acre inches					Crop Yield	Size of stream c.f.s.		SOIL	
			No. of	Inches	Max.	Min.	Average		Min.	Max.	Surface	Sub
58	Alfalfa	10.0	5	7.1	1.5	1.4	1.4	4 t	1.11	1.23		
60	Beets	6.0	5	16.9	4.7	2.1	3.4	22 t	1.5	2.4	cl	
	Potatoes	2.0	4	10.9	3.5	1.7	2.8	130 b				
	Wheat	4.0	3	11.4	4.5	3.3	3.8	33 b				
	Barley	6.0	2	6.3	3.3	3.0	3.1	70 b				
74	Beets	4.0	5	5.4	1.6	0.7	1.1	12½ t	1.1	1.7	s	
	Barley	2.0	4	6.0	1.8	1.1	1.5	55 b				
	Potatoes	1.0	6	23.0	4.9	2.5	3.9	125 b				
78	Oats	3.0	2	2.9	1.7	1.2	1.5	35 b	1.4	2.4		
	Wheat	6.0	3	4.1	1.7	1.2	1.4	30 b				
79	Alfalfa	10.0	10	24.8	6.2	1.2	2.5	3 t	.96	1.3	cl	
	Beets	3.0	7	11.9	2.2	1.5	1.7	-				
	Potatoes	2.0	5	7.6	1.6	1.4	1.5	-				
	Tomatoes	2.0	4	5.9	1.6	1.3	1.5	-				
80	Beets	10.0	7	8.5	1.5	0.9	1.2	20 t	.8	1.0		
81	Beets	6.0	8	22.0	3.4	2.3	2.7	20 t	1.2	1.75		
83	Alfalfa	6.0	1	1.9	1.9	1.9	1.9	4 t	1.0	1.7		
	Beets	6.0	4	8.3	2.4	1.8	2.1	17 t				
	Potatoes	4.0	3	3.6	1.3	1.0	1.2	90 b				
	Oats	8.0	3	11.1	6.2	1.8	3.7	50 b				
84	Alfalfa	6.5	2	3.8	2.6	1.1	1.9	3 t	1.4	2.0		
	Barley	5.5	1	3.8	3.8	3.8	3.8	40 b				
	Potatoes	3.0	2	6.4	4.1	2.3	3.1	100 b				
	Oats	6.0	2	5.7	4.2	1.5	2.8	50 b				
	Wheat	2.5	2	4.5	2.5	2.0	2.3	30 b				

Table 17 - Continued

Town **Hooper** Year 1938

Farm No.	CROP	Acres	IRRIGATIONS - Acre inches					Crop Yield	Size of stream c.f.s.		SOIL	
			No. of	Inches	Max.	Min.	Average		Min.	Max.	Surface	Sub
85	**Alfalfa**	4.0	5	14.1	6.1	1.7	2.8	4 t	1.11	1.28	s	
	Barley	1.0	1	2.1	2.1	2.1	2.1	55 b				
	Beets	4.0	7	17.5	2.7	2.4	2.5	18 t				
	Peas	2.0	2	6.4	4.0	2.4	3.2	2 t				
86	**Alfalfa**	9.0	12	35.0	3.9	1.6	3.0	5 t	2.2	2.8		
	Beets	13.0	11	27.0	3.8	1.9	2.6	20 t				
	Potatoes	3.0	9	18.4	4.8	2.7	2.5	200 b				
	Wheat	5.0	2	12.5	7.0	5.5	6.3	35 b				
87	**Beets**	3.5	4	19.8	5.4	4.6	4.9	-	1.4	2.4	s1	
	Potatoes	2.5	3	12.5	4.3	3.9	4.2	-				
	Peas	2.0	3	20.4	9.6	4.8	6.8	1.4				
	Wheat	3.5	4	19.5	7.5	3.8	4.9	-				